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Changing Xauxa Foodways:  
A Paleoethnobotanical Study of Domestic Structures in the Mantaro Valley, Peru  
Before and After the Inka Conquest

By

Rachel Miriam Cane

A dissertation submitted in partial satisfaction of the

requirements for the degree of

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in

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in the

Graduate Division

of the

University of California, Berkeley

Committee in charge:

Professor Christine A. Hastorf, Chair

Professor Rosemary A. Joyce

Professor Lewis J. Feldman

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Abstract

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Before and After the Inka Conquest

by

Rachel Miriam Cane

Doctor of Philosophy in Anthropology

University of California, Berkeley

Professor Christine A. Hastorf, Chair

This dissertation presents a multivariate statistical analysis of archaeobotanical data to explore food-related practices in Xauxa households before and after the Inka conquest. The investigation takes a practice-based approach to the study of households and foodways, positing that daily life consists of actions that simultaneously are shaped by and transform underlying structures.

The study poses three related questions: (1) What was the nature of Xauxa household plant use? (2) How did domestic food-related practices vary across households, among sites, and over time? (3) In what ways did feasting activities among the Xauxa serve as an expression of their changing political economy?

This is a paleoethnobotanical investigation in both methodology and interpretive approach. Exploratory data analysis is used to identify patterns in the archaeobotanical data, which are argued to reflect patterns of human activity. By examining plant remains from individual domestic spaces, this study is able to characterize aspects of Xauxa foodways at the household level that both demonstrate and modulate social contestation and political transformations throughout the region over time.

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## CHAPTER 1

### INTRODUCTION

In the mid-fifteenth century, as the Inka attempted to expand their empire into the fertile Mantaro Valley in the Andean highlands of central Peru, they encountered fierce resistance from a group occupying the northern part of the region. The Xauxa were farmers and herders who, a century earlier, had left many scattered sites in the valley bottom and had gathered in fortified hilltop centers. Their early urban settlements showed signs of increasing social stratification, and ethnohistoric documents describe *cinchecona*, or warleaders, who organized community defenses and likely served as civic leaders. The Xauxa opposition to the Inka was ultimately unsuccessful, and under Inka rule all but three of the Xauxa hilltop centers were abandoned. The Xauxa population was relocated to smaller, indefensible sites down the hillslopes and closer to the agricultural valley bottom, and the Inka established a major regional center to the south of the Yanamarca Valley. The Xauxa continued to farm and herd in their smaller settlements, likely overseen by local administrators, increasing their agricultural production in part to satisfy the demands of the Inka state. The Spanish conquest in 1533 ended Inka rule in the Mantaro Valley, and the region was reorganized under Spanish administration, the Xauxa continue to occupy many of their settlements throughout the colonial period.

Previous archaeological research in the Mantaro Valley has investigated the ways in which the radical social and political changes experienced by the Xauxa were manifest at the local level and in their domestic economy. To this end, the Upper Mantaro Archaeological Research Project (UMARP) conducted excavations of residential structures at several Xauxa sites before and after the Inka conquest. The project is notable, among other reasons, for its extensive systematic collection of botanical remains. As farmers and herders, the Xauxa were intimately connected with plants at every level of their lives. The archaeobotanical data set from the Mantaro Valley provides a unique window into the interactions between the Xauxa and the plants that entered their domestic spaces.

This dissertation presents a multivariate statistical analysis of the archaeobotanical data to explore food-related practices in Xauxa households before and after the Inka conquest. The investigation takes a practice-based approach to the study of households and foodways, positing that daily life consists of actions that simultaneously are shaped by and transform underlying structures. The material expressions of domestic routines may therefore reveal social, economic, and political processes, while at the same time acting to modulate them. Food-related activities comprise a large part of daily practice, and the study of foodways allows for a consideration of both social performance and material culture.

This dissertation is a paleoethnobotanical investigation in both methodology and interpretive approach. It uses a botanical assemblage as its primary data set, and is concerned

with the issues of sampling, collection, recovery, identification, and analysis that are germane to archaeobotanical data. The study also gives consideration to the natural and cultural transformation processes that affect the deposition and preservation of botanical remains in the archaeological record. Exploratory data analysis is used to identify patterns in the archaeobotanical data; associations among the different botanical remains and archaeological contexts are argued to reflect patterns of human activity. By examining plant remains from individual domestic spaces, this study is able to characterize aspects of Xauxa foodways at the household level that both reflect and modulate social contestation and political transformations throughout the region over time.

## **The Study Questions**

Three interrelated questions are addressed in this dissertation:

(1) What was the nature of Xauxa household plant use?

The study includes a careful consideration of every plant represented in the archaeobotanical data set, drawing on previous archaeological, ethnohistoric, and ethnographic research in the region to understand the significance of their presence in Xauxa domestic contexts. The investigations are concerned primarily with characterizing Xauxa food-related plant use, but other patterns that emerge from the analysis, such as differential fuel access and the role of dung and weedy seeds, are discussed as well.

(2) How did domestic food-related practices vary across households, among sites, and over time?

While it appears that every Xauxa household generally used the same plants in the same ways over both space and time, this research identifies subtle yet significant variations in patterns of botanical deposition that are interpreted as reflecting differences in household food-related practices. The paleoethnobotanical analysis highlights differences among Xauxa sites prior to the Inka conquest that help to shed light on social and political processes playing out during this time period. Similarly, the study contributes to our understanding of status distinctions among the Xauxa, and how these distinctions may have been both blurred and negotiated at different sites over time.

(3) In what ways did feasting activities among the Xauxa serve as an expression of the changing political economy?

This research identifies a pattern of botanical deposition in two Xauxa domestic structures that is argued to represent household-based feasting activities that took place prior to the Inka conquest. All Xauxa households under both Inka and Spanish rule appear to have had more access to high-value foods, but this investigation finds no evidence for household-based feasts hosted by the Xauxa during these time periods. Rather, it appears that feasting became the purview of the Inka state. The study explores the implications that feasting may have had for the negotiation of power and command of labor resources in pre-Inka Xauxa centers, and the significance of this postulated movement of feasts out of Xauxa households.

## Organization of the Dissertation

Chapter 2 introduces the study area. The chapter begins with an overview of the Xauxa, giving a history of their political development and changing settlement patterns. The ecology of the Upper Mantaro River Valley is described to characterize the setting in which the Xauxa practiced agriculture. The chapter continues with a review of previous research in the Mantaro Valley, focusing on the UMARP investigations, their objectives and sampling strategies, and specifically the paleoethnobotanical research that was conducted as part of that project and formed the basis of this research. The chapter concludes with a description of the four sites investigated in this study and each of the domestic structures that are examined.

Chapter 3 describes the theoretical approaches that frame this investigation. The chapter begins with an overview of household archaeology and some theoretical concerns of relevance to this approach. Attention is drawn to variability in household membership, as well as ways in which households can articulate with each other in larger social, political, and economic associations. The chapter continues with an overview of practice theory, presenting several case studies that illustrate how this approach can be applied to questions of social inequality, ethnicity, and political development. Next the chapter turns to a consideration of foodways, discussing the ways in which food and all of its related activities can contribute to the formation of shared meanings, social identity, and political structures. Finally, the chapter examines feasting as a practice that combines both social performance and materiality, and one that may be uniquely visible in the archaeological record. The chapter concludes with an overview of the special importance of *chicha*, or maize beer, in Andean feasting traditions.

Chapter 4 introduces the study of paleoethnobotany and presents an overview of its methodology and interpretive approach. The chapter reviews procedures for the collection and identification of plant remains from archaeological sites and describes the protocols followed by the UMARP investigators. The taphonomic considerations that both constrain and inform this study are discussed. The chapter then explains how several different univariate and multivariate statistical techniques can be applied to archaeobotanical data analysis, paying particular attention to exploratory tools that allow investigators to search for patterns in the data and generate hypotheses. Correspondence analysis is introduced as the primary statistical method used in this study. The final section of the chapter reviews the interpretation of paleoethnobotanical data, showing how previous research in paleoethnobotany has addressed questions such as the origins of agriculture, environmental stability and change, subsistence strategies, and socio-political development.

Chapter 5 presents the analysis of the paleoethnobotanical data. The first part of the chapter consists of a description of all of the different types of botanical remains that were recovered from Xauxa domestic contexts, providing background information on their possible ethnobotanical uses. For the purposes of analysis, items with low counts are grouped into categories, and the rationale behind these groupings is explained. The botanical categories are further classified as food and non-food related, and these classifications are justified. The next part of the chapter describes the variables used in the statistical analysis, which include archaeological contexts such as site, phase, and patio group, as well as the botanical categories. The method by which the raw counts were transformed into a modified version of standardized densities is described. The third part of the chapter presents the results the paleoethnobotanical analysis. First the data is analyzed on a regional level, and then each site is considered separately. Finally the distribution of botanical remains within a single compound is examined.

Together, these different levels of analysis build a nuanced picture of Xauxa household plant use over space and time.

Chapter 6 is a concluding discussion. The chapter returns to the three questions posed in this introduction to summarize the results of the paleoethnobotanical analysis. The chapter demonstrates how the findings of this study can be understood in light of the theoretical approaches described in Chapter 3. The dissertation ends with a discussion of the ways in which this study both explores and may contribute to certain methodological issues in paleoethnobotany.

## CHAPTER 2

### THE STUDY AREA

#### Introduction

This study investigates foodways of the prehispanic Xauxa who lived in the northern part of the Mantaro Valley in the Andean highlands of central Peru. The time period under examination begins in about 1350 CE, when the Xauxa were politically autonomous, through their incorporation into the Inka empire in about 1450 CE, to the Spanish conquest in 1533. The data analyzed were recovered during the 1982 and 1983 field seasons of the Upper Mantaro Archaeological Research Project (UMARP), directed by Tim Earle, Terry D'Altroy and Christine Hastorf, which conducted excavations of domestic structures at several different Xauxa sites to investigate the impact of Inka rule on the domestic economy. This study aims to build on findings from the UMARP investigations by focusing on a contextual analysis of the botanical remains to uncover trends and variability in the preparation and consumption of food on the household level.

This chapter begins with an overview of the Xauxa, with a history of their political development and settlement patterns, and the ecology of the Upper Mantaro River Valley in which they practiced agriculture. It continues with an overview of the UMARP investigations, their objectives and sampling strategies, and specifically the paleoethnobotanical research that was conducted. It concludes with a description of the four specific sites and each of their domestic structures that are examined in this study.

#### THE XAUXA

The late prehispanic Xauxa comprised the northern division of three groups living in the Upper Mantaro region that the Inka collectively referred to as the Wanka ethnic group (D'Altroy 2001a; Hastorf 1990). The Xauxa territory centers on the Yanamarca Valley, an internally draining basin in the northwest area of the Mantaro Valley. Previous research has documented continuous occupation of the area from at least 900 BCE (Hastorf 1990; Hastorf et al. 1989), and its residents appear to have relied on agriculture by at least 200 CE (Earle et al. 1987; Sandefur 1988b.) A series of changes in settlement patterns and ceramic styles around 900 CE marks the beginning of what has been termed the Wanka sequence of archaeological phases, which continue through the Spanish conquest (LeBlanc 1981).

It should be noted that the term *Wanka* can refer both to a social group and a chronological sequence, and that it is synonymous with its alternate spelling *Huanca*. While many previous UMARP publications have used the term *Wanka* to refer to the population under

investigation, this study follows the decision of D'Altroy and Hastorf (2001) to use the more specific term *Xauxa* (which is synonymous with its alternate spelling *Sausa*), because the UMARP research area lies entirely within the territory of this northern ethnic group. The chronological sequence of UMARP Wanka archaeological phases, however, applies to the Xauxa, and so that terminology is retained (D'Altroy 2001a:27). The specific dates associated with the Wanka phases follow D'Altroy and Hastorf (2001).

The Wanka sequence is divided into four phases, each one marked by a distinctive change in settlement patterns or political organization. The data from this study derive mostly from Wanka II and III, the periods immediately before and after the Inka conquest, with some data from the Spanish colonial Wanka IV phase included for comparative purposes.

### **Wanka I (1000-1350 CE)**

The population of the Upper Mantaro Valley during Wanka I was dispersed into many small, non-hierarchical settlements, but there appears to have been some degree of political consolidation and spheres of exchange. Forty-three Wanka I sites have been identified throughout the Yanamarca Valley and its hillslopes, as well as to the south and east into the main Mantaro Valley (D'Altroy 2001a). These sites are slightly larger than settlements prior to the Wanka sequence, and new sites tend to be established upslope from the valley floors (Hastorf 1990). While site size increased, the size of domestic structures seems to have decreased, and the density of household compounds within the sites grew (D'Altroy 2001a). Lithic and botanical evidence indicate intensification of agriculture on the valley bottoms, and new varieties of maize appear at this time (Russell 1988b; Johannessen and Hastorf 1989.)

The local Wanka I phase corresponds with the end of the Middle Horizon and the beginning of the Late Intermediate period in regional Andean prehistory. During the Middle Horizon many polities in the central Andean highlands show the strong influence exerted by the Wari urban center in the Ayacucho basin, located just south of the Mantaro River Valley (Isbell 1988; Schrieber 1992). The southern end of the Mantaro Valley shows clear Wari influence with a complex of corporate-ceremonial buildings in the Ayacucho style at the spring of Wari Willka (D'Altroy 2001; Moseley 2001), but UMARP research showed little evidence for Wari influence in the Xauxa study zone (D'Altroy 2001; Lennstrom 1991:329). The Middle Horizon ended with a several centuries of above-average rainfall, and the Late Intermediate Period was marked by the beginning of prolonged drought conditions. The upslope movement of settlements apparent in Wanka I was common throughout the sierra region, as higher, moister elevations allowed the residents to take advantage of rainfall agriculture (Moseley 2001). The agricultural intensification evident in the valley bottoms at this time was likely spurred by the drier conditions.

### **Wanka II (1350-1450 CE)**

D'Altroy (2001a) summarizes the changes in settlement patterns and political organization that characterize the Wanka II phase:

Radical changes in social organization took place in the Mantaro region shortly before the Inka conquest. A rapidly growing population became concentrated in incipiently urban communities that were situated and constructed defensively. Thirty-eight sites have been recorded for the entire UMARP survey region. ... The total population estimated for those settlements fell between about 37,000 and 61,000 (at 60-100% occupation). Because the occupational density at Wanka II settlements was high, we estimate that the actual population probably fell close to the upper end of this range. ...

Like their immediate ancestors, the Wanka II people were farmers and herders. In the Yanamarca and main Mantaro Valleys, however, productive valley bottoms were abandoned<sup>1</sup>, while large, fortified towns were built on hillcrests on the west side of the Yanamarca. The shift to higher elevations restricted the range of easily available productive zones, so that there was an increased emphasis on tuber and highland grain cultivation ([Hastorf 2001b]; Hastorf 1993). Wanka II sites were typically encircled by massive stone walls and the main residential sectors at the largest sites were additionally protected. Most sites were build on ridge crests with springs. (p 39)

While population size, site size, and site densities all increased, there is also evidence for the development of a regional settlement hierarchy. The sites of Tunanmarca and Hatunmarca in the Yanamarca Valley are thought to have served as two major centers, based on their sizes (25 and 74 ha) and distribution of ceramics at smaller surrounding sites (LeBlanc 1981; Hastorf 1990). Additionally, a system of irrigation canals links the northern alliance of sites, whose center was Tunanmarca (Hastorf 2001b). Irrigation in these hilltop areas had the potential to double crop yield, and the extent of these canals indicates a fairly complex system of planning and management (Hastorf and Earle 1985).

The defensible hill crest locations and extensive fortifications of Wanka II sites suggest heightened competition and warfare, and increased social stratification is evident from architecture and artifacts, as well as the ethnohistorical record (D'Altroy 1981). Spanish chroniclers recording the history of the region from Wanka informants describe *cinchecona*, or warleaders, who organized community defense as well as possibly serving as civic leaders (D'Altroy 1981; Hastorf 1983). The documents cite the accrual of land, women, herds, and prestige by the *cinchecona* as primary motivations for warfare (D'Altroy 1981:169). Household compounds within the Wanka II sites vary in their size and quality, furthering emphasizing the emergence of an elite class who had differential access to power, wealth, and prestige (Earle et al. 1987). Artifactual evidence from these larger household compounds demonstrates that their residents had more overall goods, and in particular more prestige items (Costin and Earle 1989; Hastorf 1993). According to D'Altroy (1981):

This picture of Late Intermediate Period political organization is one of flux. Periodic warfare and appropriation of land would have contributed to occasional territorial reorganization and the political system itself may have been in a dynamic phase. The dispersal of captured lands among the military elite would have promoted a system in which favored individuals or lineages could consolidate control of a critical resource in a proportion exceeding that of the general populace. A mechanism was thus present for the development of strongly differentiated social groups within polities, with unequal access to land and labor, prior to the Inca conquest. (p 170)

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<sup>1</sup> While Hastorf (personal communication) agrees that these valley bottoms were not resided in, she argues that they were not in fact abandoned, but may have continued to be used and cultivated.

### **Wanka III (1450-1533 CE)**

The Wanka III phase is the period during which the Xauxa were incorporated into the aggressively expanding Inka empire. The exact date of the Inka conquest of the Wanka region is not clear, but this study follows D'Altroy and Hastorf (2001) in accepting that the Wanka III phase began in the mid-fifteenth century. Ethnohistoric documents report that while the Inka met with little opposition in the main Mantaro Valley, the Xauxa put up a vigorous resistance (D'Altroy 2001a).

Under Inka rule, all but three of the Xauxa's Wanka II settlements were abandoned. Of particular relevance to this study, the site of Hatunmarca continued to be occupied, but was significantly reduced in size. The Xauxa population relocated to smaller, indefensible sites down the hillslopes and closer to the agricultural valley bottoms. It is likely that this was part of a documented Inka strategy of reorganization and relocation of hostile political groups (D'Altroy 1981). This resettlement program would have undermined the Xauxa's ability to resist the Inka by moving them out of their fortified hilltop sites and breaking up internal networks of social and political organization (D'Altroy 1981). It would have also increased agricultural production, and specifically maize production, for the Inka state by moving the population closer to more arable land in the valley bottoms (LeVine 1987; Hastorf 2001b). The enforced peace under Inka rule may have also made it more attractive for the Xauxa to leave their fortified hilltops and live closer to productive agricultural land (Hastorf 1993).

The Inka presence in the Xauxa region would have been highly visible on the landscape during Wanka III times. To the south of the Yanamarca Valley, the Inka built the major regional center of Hatun Xauxa, as well as a network of roads and small sites along the roads in the main Mantaro Valley (D'Altroy 2001). Although surface remains at Hatun Xauxa are destroyed, Spanish chroniclers describe it as a grand settlement with a large main plaza, resident artisans, and a sequestered compound for *aqllakuna*, unmarried women who worked for the state to produce cloth and *chicha* maize beer (D'Altroy 2001:44). Moreover, the Inka constructed many large storage complexes with over 2,000 storehouses (*qollqa*) throughout the Mantaro Valley, with an especially dense concentration just west of Hatun Xauxa, overlooking the Yanamarca Valley (D'Altroy and Hastorf 1984). These storehouses likely contained both agricultural and craft goods produced by the local population and stockpiled through a centrally managed system to redistribute in return for labor service to the state (D'Altroy and Hastorf 1984). This system of Inka staple finance is evident at other provincial centers, but the well-preserved *qollqas* of the Xauxa region have the greatest regional storage capacity known to date (D'Altroy 2001:45).

Local elites during Wanka III times were appointed state officials in the administrative hierarchy (D'Altroy 2001). It is unclear if these state officials came from the same lineages as the Wanka II *cinchecona*, but they were responsible for carrying out state duties and oversaw much smaller groups than the largest indigenous social groups (D'Altroy 2001:45). Previous UMARP research has demonstrated a leveling effect within the Xauxa population under Inka rule: while the general population seems to have gained more access to higher quality goods on a more regular basis, the domestic compounds of Wanka III elites do not show the same access to prestige goods as their Wanka II counterparts (Hastorf and Johannessen 1993).

## **Wanka IV (1533 -1570 CE)**

Inka rule in the Xauxa region ended with the Spanish conquest in 1533. The Spanish established the regional capital city of Jauja just north of Hatun Xauxa. Some Xauxa Wanka III sites continued to be occupied during Spanish colonial times, despite the radical change in the political organization of the region. Although colonial period investigations were not part of the UMARP research design, excavations at some household compounds ended up documenting colonial period occupation distinct from modern contamination (Earle et al. 1987). This period was assigned the phase designation Wanka IV, and material from this phase are included in this study for comparative purposes.

## **The Natural Environment of the Upper Mantaro Valley**

The climatic and vegetational history of the Mantaro region has been well documented (eg. Seltzer and Hastorf 1990), as well as the modern agricultural practices of its residents (Hastorf 1983; 1993). Unless otherwise noted, the following description is taken from Hastorf (2001a).

The Upper Mantaro Valley is a particularly fertile area of the Andean highlands known for its agricultural richness as well as easy access to multiple ecological zones. A key strategy throughout Andean prehistory was the use of multiple ecological zones to support a population. The dramatic elevation changes in the Andes create a system of vertical zonation in which differing temperature regimes support different forms of plant and animal life. The residents of the Upper Mantaro Valley were able to take advantage of multiple zones, including the fertile valley floors, for a productive agro-pastoral economy.

While temperature in the Andes varies with elevation, moisture regimes tend to vary with weather patterns and location to produce localized climatic conditions. The Yanamarca Valley of the Xauxa is one of three main tributary basins in the Mantaro region. The topographical and climatic boundaries of this intermontane area help to define the geo-political boundaries of the Xauxa ethnic group. This intermontane area encompasses regions suited for three main Andean resource strategies: maize farming in valley bottoms, tuber farming in rolling and high uplands, and high upland herding. Paleoclimatic data suggest that during the prehispanic Wanka sequence the region was cooler and drier than it is today. While similar Andean crops could have been grown, the upper limits of agricultural production along the slopes would have been lower, and the need for irrigation more pronounced.

Hastorf (1983, 2001a) synthesizes descriptions of microzones by other geographers and biologists to identify eight culturally meaningful biotic zones of land use in the Mantaro region:

- 1) The northern part of the Mantaro Valley corresponds to Pulgar Vidal's (1967) *quechua* zone. It consists of flat alluvial benches along the river and alluvial fans along the tributaries. Prehistoric agriculture in this zone most likely included maize farming with small-scale irrigation.
- 2) The floors of the tributary valleys include the Yanamarca Valley. These are somewhat higher, moister and cooler than the main Mantaro Valley. Prehistoric evidence of drained fields from these areas demonstrate that they were farmed prehistorically. Today grains, legumes, and tubers are grown in this zone with small-scale irrigation, as well as maize.

- 3) The hill slopes surrounding the tributary valleys comprise part of Pulgar Vidal's (1967) *suní* zone. They show remains of prehistoric agricultural terraces, and today areas in this zone are used to cultivate tubers. Indigenous legumes also do well in this zone, although they are not extensively cultivated today.
- 4) Rolling uplands lie above the hill slopes to the north and west of the valleys. This zone also lies within Pulgar Vidal's (1967) *suní* zone, although it can be distinguished from the hill slopes by the deep, fertile soil and distinctive communities of wild plants, many of which have been recovered in the archaeological record as well. The shrubby cover that once dominated the area has mostly been cleared for fuel or farming. Domesticated animals graze in this rolling upland zone, and wild animals are found here as well. Domesticated crops in this zone consist mostly of tubers.
- 5) The high upland zone has marginal agricultural, but the more frost-resistant varieties of tubers can be cultivated here. Camelid herding is common, and the production cycle often includes forage crops. This zone is equivalent to the Pulgar Vidal's (1967) low *puna*.
- 6) The *puna* zone (corresponding to Pulgar Vidal's (1967) high *puna*) is located above the limits of agriculture. Today camelids and sheep are herded in this region.
- 7) The rocky glacial cordillera serves as the home of the Andean *apus* or dieties, as well as the source of prehispanic copper and silver extraction.
- 8) The *ceja de montana* zone, or *rupa* zone of Pulgar Vidal (1967), was also indirectly involved with the resources of the prehistoric Xauxa. Situated on the eastern slopes of the Cordillera Blanca to the east of the Mantaro Valley, this area was comprised of dense tropical forest above the Amazon Basin. Botanical evidence suggests that some prehistoric residents of the Yanamarca Valley had access to tropical plants grown in this zone, which may have played an important role in creating and maintaining social and political power distinctions.

## THE ARCHAEOLOGICAL RESEARCH

The data upon which this study is based were collected during the second phase of the Upper Mantaro Archaeological Research Project (UMARP.) This section will give a brief overview of previous research in the region and a summary of the UMARP investigations, with specific attention to the paleoethnobotanical research.

### Previous Research in the Upper Mantaro Valley

The earliest recorded impressions of the Inka center of Hatun Xauxa, its storage structures, and nearby Late Intermediate Period ruins came from Spanish chronicler Cieza de León and, three centuries later, from French diplomat and travel writer Charles Wiener (D'Altroy 2001). Archaeological investigations began in the mid-twentieth century with the development of ceramic chronologies for the region (Rowe 1944; Kroeber 1944; Horkheimer 1951; Lumbreras 1957, 1959; Fung 1959; Flores 1959; Lavallée 1967; in Costin 1986:11). Various scholars also provided descriptions of particular Xauxa area sites (eg. García 1942; Von

Hagen 1955; in D'Altroy 1981:18; Porras Barrenechea 1950; Guzmán Ladrón de Guevara 1959; in D'Altroy 2001:29).

The first systematic studies of regional settlement patterns were initiated in the 1950's by Ramiro Matos and continued over two decades (1959, 1975; in Costin 1986:11). In the 1970's, Jeffrey Parsons and Charles Hastings collaborated with Matos on the Junín Project (Parsons and Hastings 1977), a survey of four main sectors of the central highlands that recorded all ceramic period sites in the region. This work establishes the area's entire prehistoric sequence that has formed the basis for subsequent research. At the same time, David Browman (in Costin 1986) conducted a settlement survey of the lower Mantaro Valley and its surrounding hills, focusing on early pastoral societies and providing a complementary source of information on settlement patterns and chronology (D'Altroy 2001:30).

### **The Upper Mantaro Archaeological Research Project**

Building on the findings of the Junín Project, the Upper Mantaro Archaeological Research Project was a multi-phase investigation into the relationships between political and economic development of the region's late prehistoric complex societies (D'Altroy 2001). The three phases of the study spanned 1977 to 1988; it was directed by Timothy Earle (University of California, Los Angeles), as well as by Terence D'Altroy and Christine Hastorf in its later phases, 1983-1988. The Upper Mantaro region was selected as an area of investigation for two reasons (Earle et al. 1979). First, prior surveys by the Junín Project had documented all of the ceramic period sites in the region, allowing for a more focused set of research questions and strategies. Secondly, results from the Junín Project indicated that two major socio-political transformations had occurred during late prehistoric times in the region: increased centralization and stratification of the indigenous societies, and the subsequent reorganization of local society under Inka rule (Earle et al. 1979:1). The Yanamarca Valley was a region of particular interest both because it encompassed a range of highland environmental resource zones, and it was home to the largest population concentration of the late prehistoric Mantaro Valley (D'Altroy 2001:33).

#### UMARP Phase I (1977-1980)

The first phase of UMARP concentrated on the late prehistoric period in the Upper Mantaro Valley. Its objectives were to refine the ceramic chronology, define basic changes in settlement patterns, as well as to provide preliminary documentation of relationships among social, political, and economic changes (Earle et al. 1977, 1978a, 1978b, 1980a, 1980b, in Costin 1986: 11-12). Using the ceramic data collected during this first phase, LeBlanc (1981) developed the local Wanka chronological sequence described above (although the Spanish colonial period designation *Wanka IV* was added later.) This more refined ceramic chronology allowed for a more detailed understanding of settlement pattern history, and more focused investigations on the nature of Inka rule in the region (eg. D'Altroy 1981). Also during this first phase, Hastorf (1983) examined both modern farming patterns and botanical materials with evidence for past agricultural intensification to investigate the relationship of resource use and changes in food procurement to political development.

### UMARP Phase II (1982-1983)

The second phase of the UMARP investigations focused on the domestic economy. Horizontal excavations of domestic structures at selected Wanka II and Wanka III period sites were designed to define the economic tasks that characterized the Xauxa domestic unit and elucidate changes in production, consumption, and exchange under Inka imperial rule. Earle et al. (1985) describes the objectives and methods of this second phase:

The principle question of interest to us is whether the radical political and social changes experienced by the Wankas following the Inka conquest were accompanied by equally dramatic changes in the local economy. In 1982 and 1983, six archaeological sites were excavated specifically to recover information on the local Wanka subsistence and craft economy. Within the context of the domestic or household unit, we aimed to reconstruct patterns of production, exchange, and use of agricultural and craft products. The Inka presence in Wanka III—along with associated regional peace, state tribute demands, and increased social stratification—was expected to increase economic differentiation (in the form of agricultural intensification and increased craft specialization), broaden exchange networks, and intensify differential access to exotic materials, wealth items, and preferred food items. (p2)

The current study of Xauxa foodways is based on data recovered during this second phase of UMARP investigations.

### UMARP Phase III (1986)

The goal of the third phase of the UMARP investigations was to clarify the long-term development of Xauxa society within the main Mantaro Valley (D'Altroy 2001:35; Hastorf et al. 1989). To this end, there were two components to the fieldwork. Stratigraphic excavations at Pancán, east of the Yanamarca Valley, recovered data from the site's continuous occupation from the Early Intermediate Period to the Late Horizon Inka rule (Lennstrom 1992). A resurvey of sites recorded by Parsons and Hastings using the refined ceramic chronology clarified the settlement pattern change throughout the Wanka sequence (D'Altroy 2001:35).

### **Archaeological Research Methods**

The sampling strategy and archaeological methods of the 1982 and 1983 UMARP field seasons are described at length elsewhere (Earle et al. 1984; Earle et al. 1985, 1987). The following summary is taken from D'Altroy (2001b), unless otherwise noted.

The sites selected for excavation in 1982 and 1983 had been dated and classified by size and apparent political position into a regional typology developed during the first UMARP phase. In order to study the transition in domestic economy from indigenous political control to life under Inka rule, residential Wanka II and Wanka III period sites of differing sizes were chosen. For the Wanka II period, excavations were carried out at the major centers of Tunanmarca and Hatunmarca, as well as the smaller subsidiary town of Umpamalca. The largest sites of the Wanka III period were Marca and a much-reduced Hatunmarca. These were both selected for excavation, along with two villages, Huancas de la Cruz and Chuchus. This study

concentrates on the data recovered from the four sites of Tunanmarca, Umpamalca, Marca, and both phases of Hatunmarca. As noted above, excavations at Marca and Hatunmarca also revealed colonial period occupations that were deemed to be securely provenienced and distinct from modern contamination. These proveniences were given the phase designation *Wanka IV*, and are included in this study for comparative purposes.

Residential Wanka period sites consisted of many groupings of small, circular structures organized in clusters around open spaces, or patios. These “patio groups” appear to have functioned as the main domestic unit. Analysis of artifacts recovered from these patio groups tends to confirm the architectural hypothesis: similar domestic production and consumption activities appear to have been carried out in each patio group, and individual structures appear to have been used for residential rather than specialized purposes. Patio groups vary in number of structures and total area, and some also have rectangular shaped structures. The patio groups of many sites appear to be further grouped into neighborhoods or residential sectors. The larger sites also have open plaza areas that may have been public ceremonial spaces, distinct from the residential areas.

Individual patio groups at each site were selected for excavation according to a designated sampling strategy. First, the patio groups were grouped into general sectors within the site on the basis of either apparent or arbitrary divisions. Next, the patio groups were classified as either “elite” or “commoner” on the basis of their total area, construction quality, number of structures, and proximity to public space. Later analysis of artifacts recovered from the patio groups tends to confirm this distinction, demonstrating that the larger, better built patio groups tend to have both a higher density and a better quality of things. As there were fewer elite patio groups, the ones to be excavated were chosen purposively, with consideration given to their locations in different sectors and states of preservation. The commoner patio groups were numbered and selected using a random number table; the first ones to meet the designated preservation criteria were excavated. A total of six patio groups from three different sites (Tunanmarca, Umpamalca, and Marca) were excavated completely during the 1982 field season. The results of these excavations allowed the design of a strategy for sampling within the patio groups in the 1983 field season. Since multiple structures within each patio group appear to have been used in similar ways, only one structure in each patio group was excavated in 1983. Any rectangular or unusually small structures were also excavated. Excavations in the patios were concentrated along walls and in corners, where it had been shown the most dense concentrations of artifacts were deposited.

### Provenience terminology

All UMARP excavations followed a standard procedure for designating proveniences and naming them. Each unique provenience was given the following code:

SITE=ARCDIV-ARCSUB-UNIT-LEVEL-LOCUS/SLASH

**SITE** - Sites were designated with a J-series number: Hatunmarca (J2), Tunanmarca (J7), Umpamalca (J41), and Marca (J54). In this study, sites are simply referred to by their number without the preceding J.

**ARCDIV** – Architectural Divisions, or individual patio groups, were numbered sequentially within each site. The unique designation for each patio group, therefore, must include the reference to its site (for instance, patio group 2=1 at Hatunmarca is distinct from patio group 41=1 at Umpamalca.) In this study, architectural divisions are also abbreviated as *Adiv*.

**ARCSUB** – Architectural Subdivisions, or individual structures, were numbered sequentially within each patio group. Open patios were also divided arbitrarily into smaller spaces, each of which was numbered as an architectural subdivision. Circular structures were assigned numbers 1-10, rectangular structures 20-29, and patio spaces 50-59. In this study, architectural subdivisions are also abbreviated as *ASD*.

**UNIT** – Architectural subdivisions were divided horizontally into units. Circular structures were usually divided into four quadrants, and ASDs in patio spaces were divided into about 1.5 x 1.5 meter squares. Units represent arbitrary divisions: they may cross-cut natural or cultural features, and their numbers were usually continued vertically into subsequent levels.

**LEVEL** – Architectural subdivisions were also divided vertically into multiple excavation levels. These levels often followed natural surfaces but in cases of complex or deep stratigraphy, may reflect arbitrary divisions assigned by the excavators. Excavation levels (indicated by Arabic numerals) were subsequently assigned to the analytical natural levels (indicated by Roman numerals.)

**LOCUS** – Any distinctive depositional context within a unit was assigned a locus number. Features or deposits that spanned units or levels were assigned the same locus number within each unit or level. All proveniences include a locus number; if there were no distinctive deposits within a unit and level, the entire provenience was assigned Locus 1.

**SLASH** – Any special collections, such as flotation samples, within a particular locus were point provenienced and given a sequential slash number.

### Archaeobotanical Methodology

Artifacts recovered during excavations included ceramics, lithics, shell, metal, faunal remains, human skeletons, and carbonized plant remains. The procedure for the systematic collection of botanical remains is of particular relevance to this study's analysis of the distribution of food-related plant remains. Chapter 4 contains a more detailed discussion of issues related to the collection, analysis, and interpretation of archaeobotanical remains.

Botanical remains were collected from soil flotation samples, as well as from the normal ¼ inch screening of all excavated soil. Six liter soil samples were taken from almost every excavated provenience below surface level from discrete point-provenienced locations. Plant remains were then recovered from these soil samples using a mechanized water-flotation system. The version of the motorized flotation system used is called the SMAP (Shell Midden Archaeological Project) system, designed and described by Watson (1976) and modified by Anabel Ford and Christine Hastorf (Hastorf 1990:270). Geological screens of 6.35 and 0.5mm were used to catch the botanical remains (Earle et al. 1985:90), which were then transferred to a fine chiffon mesh by a water spray (Hastorf 1990:270).

To get a systematic sample of plant remains, excavators took soil flotation samples at each unit and level and most special loci. Excavators also collected botanical remains found in

the screen soil from the rest of the excavations, although these would be biased towards larger, recognizable items. The flotation and screen samples therefore comprise two complementary botanical datasets. Materials from both collections were shipped to the Archaeobotany Laboratory at the University of Minnesota, where they were sorted using a dissecting microscope. Plant remains were identified on the basis of their morphology using an Andean plant reference collection (Hastorf 1990:270).

## **THE EXCAVATION AREAS**

The data analyzed in this study come from a total of 28 different patio groups at 4 different sites. Table 2.1 shows the status and phases assigned to each excavated patio group at the four different sites. Twenty-four of these patio groups had single-component occupations dating from only one phase. Of these, fourteen were dated to Wanka II, seven were Wanka III, and three at Marca were found to be Wanka IV. Four patio groups, all at Hatunmarca, had multi-component occupations: one spanned Wanka II and III, one spanned Wanka III and IV, and two were occupied during all three phases.

As described above, patio groups were classified by apparent status prior to excavation on the basis of size, number of structures, and quality of construction. Subsequent artifact analysis tended to confirm this distinction, although some patio groups were reclassified during excavation on the basis of preliminary finds (see below.) As discussed in more detail in Chapter 3, social status is not always commensurate with power and wealth, and the ways in which it is displayed and made visible in the archaeological record may vary (Orser 1988). Moreover, status is unlikely to have a simple binary distribution, or even a static position on a gradient; rather, social status may be negotiated and contested as members of a society seek to define and maintain their positions (Orser 1988; Robin 2003). With that in mind, this study accepts the distinctions made by previous UMARP researchers, and will use the terms *elite* and *commoner* as a shorthand to refer to larger, higher quality, wealthier patio groups on the one hand and smaller, more poorly built patio groups with fewer things on the other. Subsequent analysis of food-related artifacts (Chapter 5) strongly supports this distinction, and sheds light on the ways in which status may have been negotiated and affirmed in Xauxa society. Of the 28 patio groups, twelve were classified as elite and fifteen as commoner. One multi-phase patio group at Hatunmarca was deemed to be elite in Wanka II and commoner in Wanka III.

The rest of this section gives an overview of each of the four sites and the patio groups that were investigated in them. Descriptions are taken directly from Earle et al. (1985) unless otherwise noted.

### **Hatunmarca (J2)**

Located on a ridge on the west side of the Yanamarca Valley, Hatunmarca (Figure 2.1) was a major center that was occupied continuously from Wanka I through Wanka IV. It is divided into two residential sectors on adjacent limestone knolls. Each residential zone is enclosed by a defensive wall, and another wall surrounds the whole site along all but its eastern edge. An additional fortification wall is situated at the settlement's most vulnerable point, along the western side of the northern knoll.

The entire site was over 70 ha, making Hatunmarca the largest site by area in the entire region (D'Altroy 2001b:68). The Wanka I settlement is thought to have been quite small, although its size is difficult to estimate due to later occupation that obscured it. During Wanka II, all of Hatunmarca appears to have been occupied, and the site is thought to have served as a major center for the southern part of the Yanamarca Valley. Although its area was greater than that of Tunanmarca, the other major Wanka II center just 5 km to the north, Hatunmarca was much less densely occupied. With an estimated 6,600 – 11,000 occupants, Hatunmarca likely had a smaller population than Tunanmarca (estimated to be about 8,000 – 13,200 individuals) (D'Altroy 2001b:68). In addition to residential construction, it is thought that the Wanka II settlement also had a central plaza with special purpose architecture, but any clear evidence of this possible civic-ceremonial space has been obscured by Wanka III rebuilding.

Unlike Tunanmarca, Hatunmarca continued to be occupied after the Inka conquest of the region, but in a much-reduced form. The settlement area of occupation was reduced and the population decreased considerably to an estimated 2,400 – 4,000 individuals. Residential occupation appears to have concentrated towards the center of each knoll. Groups of buildings identified as elite residences in association with civic-ceremonial architecture are found at the center of each knoll, although the central area of the southern knoll is larger and more complex. Many of the central structures on both knolls show Inka influence in their design and detail, and Inka ceramics are well represented in both elite and commoner patio groups. The overall impression is that the Wanka III elites of a subdued and reduced Hatunmarca acted as local administrators for the Inka state, and used the trappings and visual vocabulary of that state to reinforce their position.

### Wanka II only

#### Commoner

**2=4** – This is a small patio group with only one structure, located at the southwest corner of the southern residential zone. The southwest corner of the patio contained midden, but no features were found. Artifacts from the standard range of domestic activities were recovered, with a notably high density of retouched flaked tools.

### Wanka III only

#### Commoner

**2=2** – This is a relatively small patio group with only one structure, located on the crest of the southern knoll slightly to the south of the central elite and civic-ceremonial area. The fairly complex depositional history reveals two Wanka III occupational components. Two circular structures were dismantled and burned in the first occupational period. The existing structure may have existed during the first occupation as well, or it may have been constructed later. Two primary subfloor burials were found in this structure. Artifacts from both occupations indicate the typical range of domestic activities.

### Wanka II and III

### Elite and Commoner

**2=6** – Earle et al. (1985) describe 2=6 as a commoner Wanka III patio group, but it appears that an earlier Wanka II elite occupation was also identified and noted in the UMARP datasets. The patio group is located towards the southern edge of the site's north knoll (see Figure 2.1). The Wanka III commoner occupation had a single structure with three burials and artifacts indicative of the normal range of domestic activities. I have not found a description of the contexts that were reassigned to the elite Wanka II occupation.

### Wanka III and IV

#### Elite

**2=1** – Located on the crest of the southern knoll, this is an elite Wanka III patio group with some occupation that continued into Wanka IV. It is a large patio group with four circular structures and two rectangular structures, one large and one small. It was particularly well preserved because, unlike many of the areas at Hatunmarca, it had not been farmed recently. The depositional history revealed at least two occupational components and major rebuilding of the patio. Burials included a particularly elaborate internment of an adult female. Most of the materials from the large rectangular structure appear to date from the Wanka IV occupation.

### Wanka II, III, and IV

#### Elite

**2=3** – This is an elite Wanka II and III patio group, with some Wanka IV occupation, located on the south knoll at the center of the elite and civic-ceremonial area, adjacent to a large plaza. The patio group is large, with a long and narrow layout, but only two circular structures along its boundaries actually open in to it and are included as part of the patio group. The stratigraphy of this patio group was the most complex of any excavated in either field season. Besides the standard domestic artifacts, burials were found from both Wanka II and III occupations and the fill of a Wanka III rebuilding project contained many metal artifacts.

**2=5** – This is a medium-sized elite patio group appears to have been built in Wanka II and remodeled during Wanka III. It has four circular structures and is connected by a door to another small patio space with a rectangular structure. Artifacts from the Wanka II occupation included a large number of ceramics related to cooking, storage and serving, but no grinding stones. The Wanka III materials include numerous cooking vessels and an ash deposit with carbonized maize, wood, large fragments of animal bones, suggestive of possible large-scale cooking activities like elite feasting.

## **Tunanmarca (J7)**

Located just north of Hatunmarca on another high ridge, Tunanmarca (Figure 2.2) was occupied only during Wanka II and served as the other major center during that phase. As mentioned above, although the area of the site was smaller than that of Hatunmarca, Tunanmarca had an unusually high occupation density, making it likely the most populous settlement in the region. It is situated in an extremely defensible location and entirely enclosed by fortification walls. The site is divided into two residential sectors that are separated by a wide, walled walkway and two large, adjacent central plazas, which may have served as a space for public or ceremonial activities (D'Altroy 2001b:68). Elite patio groups tend to be located near the center of the site and the two open plazas. Unlike Hatunmarca, the preservation at Tunanmarca was excellent because the site has not been disturbed by farming.

### Elite

**7=2** – This large elite patio group has six circular structures and unusually high quality masonry. It is located on the ridge to the north of the central plaza. Large dressed limestone blocks define the entrance at the north side of the compound. A short wall within the patio space partially closes off the northeast corner, creating a possible area for storage. Like other compounds at Tunanmarca, the depositional history shows a single component occupation. Three primary burials were found in structures, as well as a concentration of disarticulated human remains, which may have been a post-occupational deposit from a surrounding structure. This patio group was completely excavated in 1982. All six structures appear to have been used for habitation rather than specialized functions, and recovered artifacts in the compound suggested a typical range of domestic activities, with higher than usual frequency of cooking and food related ceramics as well as grinding stones.

**7=3** – This patio group was originally chosen for excavation as a commoner compound on the basis of its size and architectural quality, but the artifacts recovered from it indicate that its residents were more likely an intermediate or elite status. It is located in the northern residential zone, near the central plaza. The patio group consists of two circular structures and patio space. A short wall between the two structures marks off a small area of the patio in a similar fashion to the short wall of 7=2. The compound was completely excavated and its depositional history shows a single occupation. Both structures appear to have been used for habitation. Numerous metal artifacts were found.

**7=7** – This is a large patio group with six circular structures, located in the central part of the northern residential zone. Excavations of two structures and five patio areas revealed a single-component occupation and artifacts indicating the normal range of domestic activities. More than the usual number of cooking and food related ceramics were found, as well as marine shell and numerous metal artifacts.

### Commoner

**7=4** – Located at the far end of the southern residential sector, this is a small patio group with a single structure. The entire patio group was excavated, revealing a short, single-component occupation with shallow deposits. No features such as hearths or burials were identified in the excavations.

**7=5** – This is a small patio group with a single structure located in the southern residential zone on the southeastern edge of the site. The compound is terraced against the natural slope of the ground, and a short wall with bedrock divides the patio into two areas. Excavation revealed a single-component occupation with the normal range of domestic artifacts. A small hearth and secondary burials were found in the structure. Camelid dung found in a small pit in the patio may have been stored there for fuel.

**7=6** – This is a medium-sized patio group in the northern residential sector with one circular structure and a rather large patio area. Complete excavation revealed a single occupation component and the usual range of domestic artifacts. No hearths, pits, or other features were found.

**7=8** – This is a medium-sized patio group in the northern residential sector with three circular structures. The depositional history reflects a short, single component occupation. The only features found were a small ash deposit just outside the door of one structure and two post-occupation burials. Animal bones found included dog and a more than usual number of bird remains.

**7=9** – This is a small patio group with one structure, located in the far northwest of the northern residential sector. The compound sits on the lowest terrace above the defensive wall. Excavations revealed a short, single component occupation with the usual range of domestic artifacts, although no hearths were found and grinding stones were rare. A female burial with a bone needle and pin was found in the structure, and a dedicatory cache that included a dog's head and paws, three miniature jars, a guinea pig, and a silver disc was found in a corner where the patio wall met the structure.

### **Umpamalca (J41)**

Umpamalca (Figure 2.3) was a Wanka II town located on a low defensible knoll southwest of Tunanmarca. The settlement is estimated to have had about 3,800 – 6,500 inhabitants (D'Altroy 2001b:71). Ceramic evidence indicates that it may have been a subsidiary site of Tunanmarca, with economic and political ties to this northern center. Like both Tunanmarca and Hatunmarca, the site is enclosed by fortifications, including defense walls and a deep trench. The density of structures within the site is fairly high, with a zone of elite patio groups to the east of the hillcrest. All of the domestic compounds excavated have shallow deposits indicating single-component occupation. There is no visible evidence of plazas or civic-ceremonial architecture at Umpamalca. Like Tunanmarca, the preservation at Umpamalca is excellent because the site has not been disturbed by farming.

### Elite

**41=1** – Located in the eastern elite zone of the site, this patio group has three structures and three different patio areas. All three structures open out onto the small central patio. A larger adjacent patio to the north is separated by the foundation of a wall which may have been dismantled during the compound's occupation. A third adjacent patio to the southwest may have been accessed through an opening in a standing wall between two of the structures. During excavation, the central patio and three structures were designated as 41=1, and the two adjacent patio groups were treated as separate architectural divisions (41=2 to the north and 41=3 to the southwest.) These three areas were combined analytically into a single patio group. It should be noted that although the entire patio group is referred to as 41=1, ASDs from the adjacent patios have a provenience format that begins with 41=2 or 41=3.

The three structures and central patio were excavated completely, while the adjacent patios were sampled. A large amount of carbonized plant remains were recovered from subfloor fill and patio midden, and three unusual and presumably high-value species were also found: *coca* (*Erythroxylum coca*) and *achiote* (*Bixa sp.*), both from the tropical forest, and tobacco, which could be local. Features included a burial and a small hearth. Besides the usual range of domestic artifacts, there was a high number of grinding stones as well as hoe fragments.

**41=8** – This large patio group is also located on the eastern side of the site. It has three circular structures and a large patio space. Two of the structures open onto the patio and a third opens onto the pathway leading into the patio. This structure contained at least five subfloor burials with goods, as well as a large ash dumping with *quinoa* just to the east of the doorway. Besides typical domestic artifacts, a number of metal objects were found in the compound. The patio group had been sampled during 1979 UMARP excavations, but these data are not included in this study.

### Commoner

**41=4** – This is a small patio group with two structures located at the far northern edge of the site. One structure and 80% of the small patio space was excavated. A small hearth and a burial were found in the structure, but the patio did not have any midden deposits. A high density of blade cores and chipped stone tools were recovered, as well as a large number of ceramic wasters, suggesting that the residents may have been involved in lithic tool and ceramic manufacture.

**41=5** – This is a very small patio group with two structures, situated on a terrace in the southern area of the site. One of the structures is unusually small and was thought perhaps to be a *chullpa*, or burial structure, but excavations demonstrated that it was used for habitation. Burials were found in both of the two structures, but no midden, hearths, or grinding stones were found. Blade cores were also absent, which is especially unusual for Umpamalca.

**41=6** – This large patio group is located near the highest point of the site. The patio group was originally selected for excavation as an elite compound, but the artifacts recovered did not support this classification. The patio group has four structures, three of which have high quality masonry. The fourth structure was small and irregular, but its deposits suggest it was also used for habitation. The function of two naturally shaped limestone rings set opposite each other into the outside walls of two structures is unknown, but possibilities include suspension of looms, hide or food drying, or tethering animals. Burials and hearths were found in both structures excavated, and a large hearth in the patio was filled with ash and carbonized llama dung.

**41=7** – This is a large patio group with one structure located against the defensive wall at the southeastern end of the site. Only 20% of the patio area was excavated due to its size. A hearth and burial were found inside the structure. In general artifacts indicated the usual range of domestic activities, but more than the usual number of wasters were recovered, suggesting possible ceramic production.

## **Marca (J54)**

Marca (Figure 2.4) was a Wanka III town situated on a low hill on the eastern side of the Yanamarca Valley. From its location, just over 5 km north of the Hatun Xauxa, it overlooks the main Mantaro Valley and the imperial Inka road that connected the Yanamarca Valley with the main valley. The settlement was established under Inka rule at a place that had been occupied during Wanka I but not during Wanka II (D’Altroy 2001b:72). Excavations also revealed a colonial Wanka IV occupation. With an estimated population of about 2,500 – 4,100 residents (D’Altroy 2001b:72), Marca may have been a slightly larger settlement than Hatunmarca during Wanka III.

The site was built on a W-shaped rise, with two main residential areas on each knoll connected by a narrow isthmus. Heavy erosion and farming have destroyed a lot of the surface architecture, but the site is fairly well preserved in a few locations. Most residential structures are the typical circular structures grouped around patios, although some rectangular structures exist in what appear to be two elite zones in the northern sector. A possible plaza is located near one elite zone on the northeast slope of the settlement.

## Wanka III

### Elite

**54=4** – This is a fairly small patio group with one large rectangular structure, one small circular structure, and possibly another small rectangular structure. It is located on the top of the eastern sector, in an area with a high density of architecture that has not been farmed and so has been better preserved than most areas at the site. Features of note included several ash pits in both the structure and the patio, indicating more than usual burning, possibly reflective of special cooking. A possible water drain was also found in the patio. Unlike its Wanka III commoner neighbor 54=2, dog bones are absent in this patio group. Grinding stones were common, and several copper artifacts were found.

**54=7** – This is a large elite patio group with two circular structures on the northeastern slope of the site, immediately above elite Wanka IV patio group 54=1. It has a more complicated depositional history than most compounds at Marca, with both Wanka III and IV components. All proveniences analyzed in this study, however, date to Wanka III. Two small hearths and a small ash pit are associated with the Wanka III occupation inside the structure, as well as eight burials with goods in a subfloor trench. The artifact profile in this patio group is different from others, with very few flake cores and chipped stone tools, and many ceramic wasters and quartz crystals, as well as some metal artifacts.

### Commoner

**54=2** – This is a moderately large patio group on the southeastern slope of the site with one to three structures. One structure is clearly associated with the patio, but the doorways for the two other structures could not be determined. Within the patio space a separate corner space with the only hearth is defined by a short wall, which was dismantled at some point during the occupation. Ceramics encrusted with organic residues were found in this area, indicating that this space may have been used as a kitchen. A multiple burial with goods was found in the structure. Artifacts generally represented the usual range of domestic activities. Dog bones were particularly common.

**54=9** – This is a small patio group with one structure located on a slope near the top of the eastern knoll. Several special features are found in the structure, including two well-defined small hearths, two small ash deposits, and seven subfloor burials. In addition to the typical domestic artifact assemblage, non-Inka storage vessels are unusually common, as well as sickle blades and spindle whorls. Post-occupational deposits include two secondary burials, metal artifacts, and fine pieces of Inka ceramics, presumably from an elite household.

**54=10** – This is a large patio group with three or four circular structures on the eastern face of the site. Despite its size, it was classified as a commoner compound based on its peripheral location and undistinctive architecture. Post-occupational disturbances made the occupation zone difficult to define clearly. Artifacts included a high density of ceramic wasters and hoes. Seven individuals appear to have been buried simultaneously inside the structure, possibly after the structure was abandoned.

### Wanka IV

#### Elite

**54=1** – This is a large patio group with two circular and one rectangular structure located on the site's northeastern slope. Complete excavation of the patio group revealed an early Wanka IV period single occupation, with a considerable amount of Wanka III artifacts in the fill. The rectangular structure appears to be somewhat later than the two circular structures. Features found include hearths and burials. Besides the general span of domestic artifacts,

many metal artifacts were found, including ones that evidence metal manufacture. Ceramics related to food production, preparation, and consumption were also common.

**54=5** – This large patio group, with one circular and one rectangular structure, is also located on the northeastern slope of the site. It overlooks what is thought to have been a civic-ceremonial compound. The deposits in this patio group probably represent a short Wanka III occupation which continued into Wanka IV. Excavations were terminated when it was found that there were extensive post-occupation disturbances and the only intact occupation had historic materials.

#### Commoner

**54=6** – Located at the northeastern fringe of the site in a moderately dense area, this is a fairly large commoner patio group with two structures. The depositional history reveals a short Wanka IV occupation, with very low artifact density in both the patio and structure excavated. A young dog burial was found in the structure, covered with a limestone slab in association with a small narrow neck jar and an iron knife.

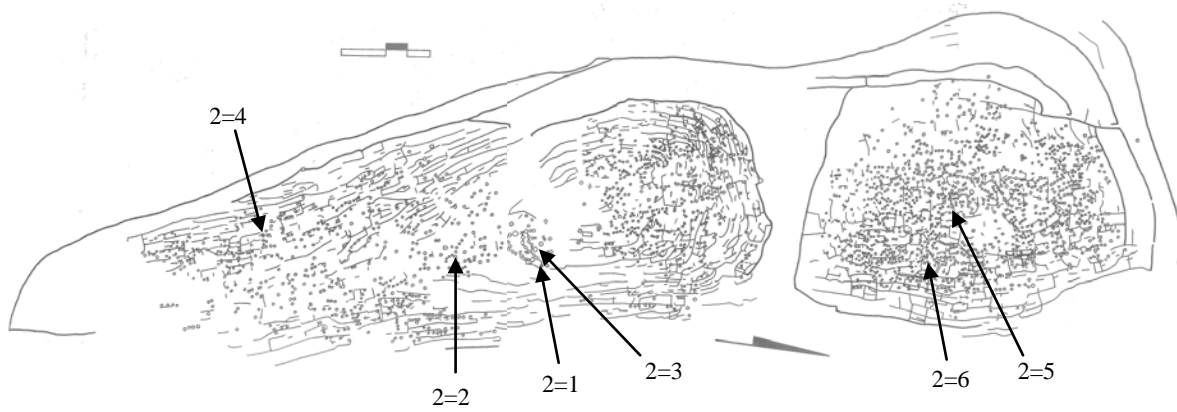
## CHAPTER 2: TABLES

**Table 2.1** – Status and phases assigned to each patio group excavated by site.

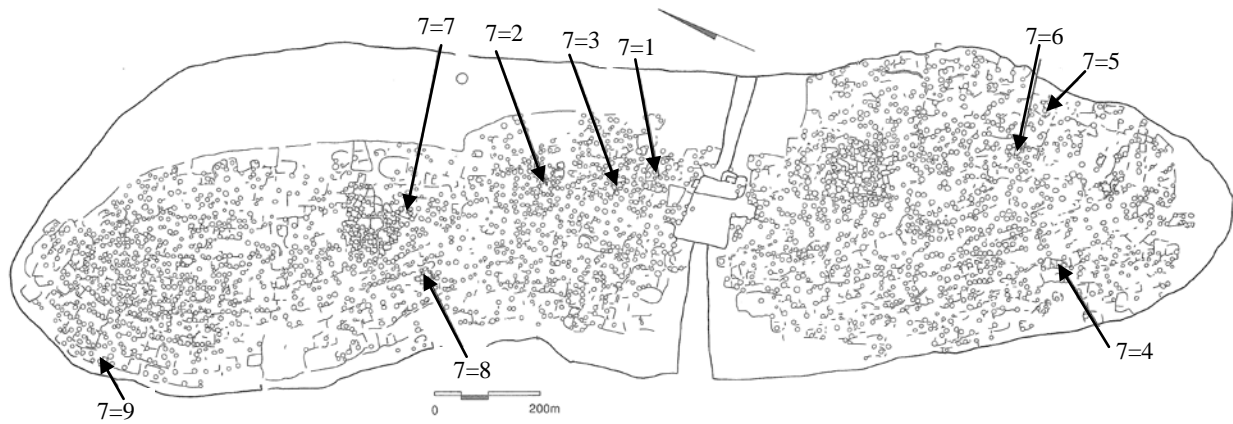
Site	Patio Group	Status	Phase
Hatunmarca	2=1	Elite	Wanka III
			Wanka IV
	2=2	Commoner	Wanka III
	2=3	Elite	Wanka II
			Wanka III
			Wanka IV
	2=4	Commoner	Wanka II
	2=5	Elite	Wanka II
			Wanka III
			Wanka IV
	2=6	Commoner	Wanka III
		Elite	Wanka II
		Wanka III	
Tunanmarca	7=2	Elite	Wanka II
	7=3	Elite	Wanka II
	7=4	Commoner	Wanka II
	7=5	Commoner	Wanka II
	7=6	Commoner	Wanka II
	7=7	Elite	Wanka II
	7=8	Commoner	Wanka II
	7=9	Commoner	Wanka II
	Umpamalca	41=1	Elite
41=4		Commoner	Wanka II
41=5		Commoner	Wanka II
41=6		Commoner	Wanka II
41=7		Commoner	Wanka II
41=8		Elite	Wanka II
Marca	54=1	Elite	Wanka IV
	54=2	Commoner	Wanka III
	54=4	Elite	Wanka III
	54=5	Elite	Wanka IV
	54=6	Commoner	Wanka IV
	54=7	Elite	Wanka III
	54=9	Commoner	Wanka III
	54=10	Commoner	Wanka III

## CHAPTER 2: FIGURES

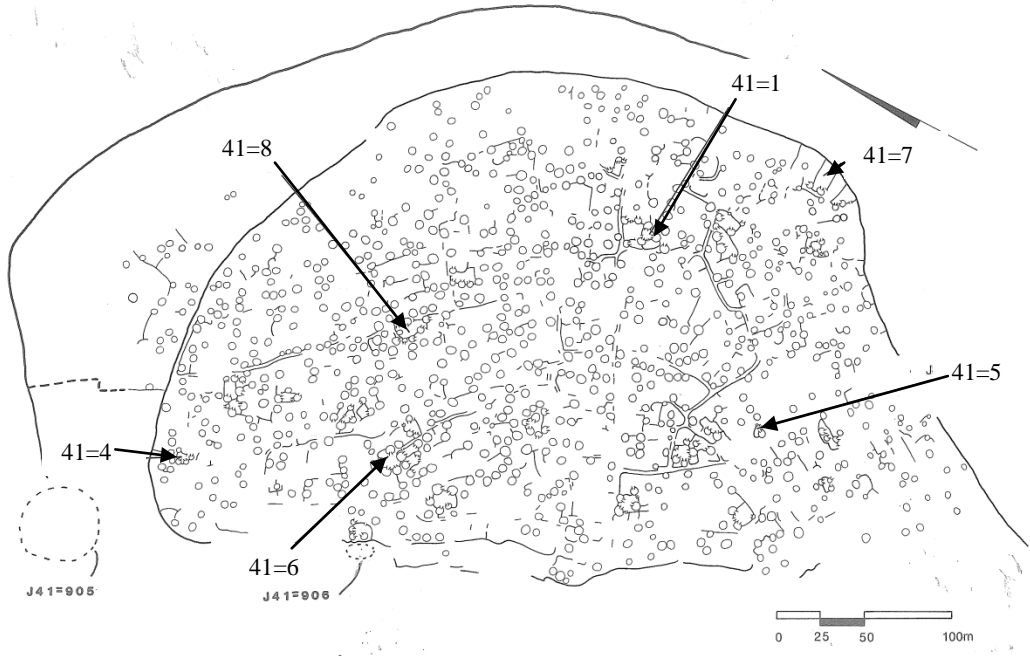
**Figure 2.1 – Site of Hatunmarca**



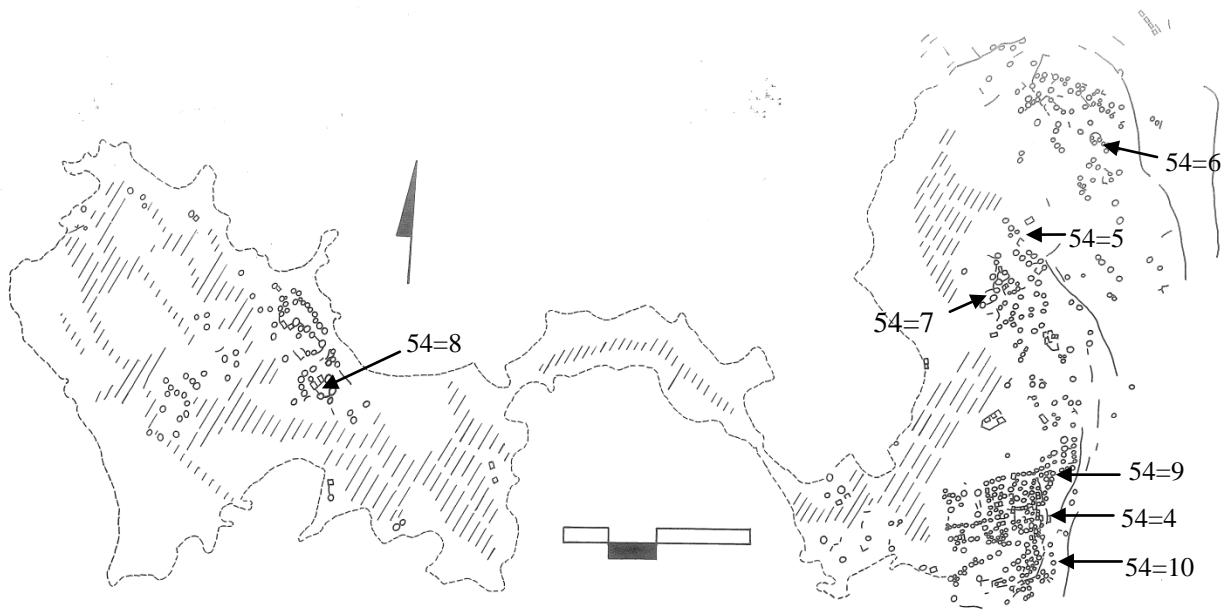
**Figure 2.2 – Site of Tunanmarca**



**Figure 2.3 – Site of Umpamalca**



**Figure 2.4 – Site of Marca**



## CHAPTER 3

### HOUSEHOLDS, PRACTICE, AND FOODWAYS

This study presents a contextual analysis of the domestic, food-related activities of the Xauxa before and after the Inka conquest. The scope of analysis begins at the level of the individual household and explores how activities in the domestic sphere articulate with changes in political organization. The research is informed by three interrelated theoretical approaches in archaeology: the study of the household, a theory of practice, and the study of foodways. The following three sections describe each of these orientations, review a portion of their relevant literature, and suggest ways in which they offer us a framework for thinking about changes in food-related practices for Xauxa households.

#### HOUSEHOLD ARCHAEOLOGY

*But is there anything left to find? Hasn't everything worthwhile been discovered?*  
--Man in university bookstore

The popular image of archaeology as the study of monumental architecture and buried treasure is pervasive, but hardly an accurate portrayal of the discipline. Scholars over the last century have increasingly turned their attention to richly informative remains that may not be as glittery or as striking on the landscape, using them to address intriguing questions about the past societies at multiple levels of organization. The field of household archaeology has emerged from investigations focusing on domestic spaces, and has made significant theoretical and methodological contributions to the practice of archaeology.

#### Definitions of the Household

While the focus of household archaeology is clearly the household, it is not necessarily clear what exactly a household is. One component of the household that is most easily accessible to the archaeologist is the physical residential structure. Thompson's (1886, 1892) early investigations of ancient Maya houses were important for demonstrating the presence of urban residential areas, allowing him to argue that Yucatecan centers were indeed true cities (Robin 2003). Later researchers have recognized that the house may not end with its walls, but rather open spaces around and within structures were often also integral parts of the house. These outside spaces may have been used for household production and consumption activities, especially in agricultural areas. According to Sanders and Killion (1992), a "house-lot in the Chontalpa consists of the house, the cleared space for work, perhaps a small vegetable garden, a couple of hectares of commercial crops, in which the variety is reduced to one or two crops, and

then an orchard with a great number of species of trees in which the food is consumed by the householders but also sold as well.” (p. 25) Dunning (2004) takes the agricultural house-lot model a step further, arguing that it can be useful to see the Maya household as a “farmstead” that also includes the physically distant milpa land holdings. In the Middle East, Horne (1982) describes ethnographic compounds or courtyard houses, consisting of multiple rooms arranged in relation to a courtyard space. She finds that households are not contained to their compounds, however, but rather most households also use rooms that are not part of their residential courtyards, and many compounds include rooms that belong to other households.

Whatever the boundaries of the residential space may be, households should not simply be equated with houses. Houses are peopled by the members of a household. Many researchers have therefore approached archaeological households as an expression of kinship structure. Laslett (1972) defines the family as “a group of persons living together, a household, what we shall call a coresident domestic group.” (p. 1) Allen and Richardson (1971) likewise argue that a consideration of residence and descent systems, as well as ethnographic information, are essential to the archaeological reconstruction of kinship. Deetz (1982) acknowledges that households do not neatly correspond with immutable kinship units, but he maintains that “we should perhaps give some thought to the family as a social unit worthy of archaeological study, while realizing that houses contained families in some form or another. The behavioral and psychological dimension of the family must in some way have been expressed, however covertly, in artifactual form and texture.” (p. 718)

Other scholars have approached the household as a window into the domestic economy. Sahlins (1972) defined the household as the basic unit of production in “economies organized by domestic groups and kinship relations.” (p. 41) Although his model of the *domestic mode of production* (DMP) has been very influential in subsequent studies of the domestic economy, Hastorf and D’Altroy (2001) point out some of its shortcomings: it essentializes the household as an immutable, homogenous unit; it assumes that households pool their production communally; and it relies on a satisficing model of household labor, in which underproduction is common.

While the study of archaeological households began earlier in the 20<sup>th</sup> century, it may be argued that household archaeology as a field emerged in the 1980’s with the addition of a behavioral definition of household. According to Wilk and Rathje (1982), the household was “composed of three elements: (1) *social*: the demographic unit, including the number and relationships of the members; (2) *material*: the dwelling, activity areas, and possessions; and (3) *behavioral*: the activities it performs.” (p. 618) Other researchers likewise emphasized how the shared activities of the household members were essential to their identification as a unit (Wilk and Netting 1984; Wilk and Ashmore 1988; Netting 1989). This behavioral concept of household recognized that production was only a part of a range of domestic activities, and highlighted the relevance of household archaeology to larger questions of social, economic, religious, and political organization.

More recently, scholars have approached households from a perspective of social practice. Hendon (1996) proposes that the household is “a symbolic construct defined and contested through practice,” (p. 48) arguing that it is the differences in social relations and activities of household members that should be explored. Both Hendon (1996) and Robin (2003) draw from feminist theory, which stresses the importance of these differences, to explore the ways in which social meaning and relationships are negotiated within households. Household archaeology is similarly informed by practice theory, which emphasizes the role of daily

activities and routines in shaping the structures that in turn frame daily life (Pader 1993; Hendon 1996; Allison 1999; Robin 2003). In keeping with these more recent works, this study primarily approaches household archaeology from a perspective of social practice, and practice theory will be discussed in more detail in the second section of this chapter.

### **Theoretical Concerns in Household Archaeology**

There are many specific theoretical concerns that are particularly relevant to the analysis of archaeological households.

#### Household Composition

Household archaeology has been applied to questions relating to household composition or membership. As measureable socio-economics units of a wider community, domestic structures have been key for demographic studies of ancient settlements (Culbert and Rice 1990). Weeks (1988) uses colonial period census data to family structure within households. Wilk (1988) cautions, however, against interpreting variation in house size and form as a direct reflection of differences in household structure and membership, arguing that it is often due to differences in agricultural production and land tenure. Differences in the deposition of domestic remains is more appropriate for viewing household membership variation.

#### Symbolism and Households

Households and their material remains can also be a rich source for symbolic analysis. Bourdieu (1970) approaches the Berber house as a window to the conceptual world. He identifies a governing set of related dualities observable in the physical arrangement of the household (male-female, light-dark, dry-wet), where the second element always contains its own internal dualities that mirror the parent pair. This structure manifest in the house he claims is “doubtless one of the simplest and most powerful that may be employed by a mythico-ritual system since it cannot oppose without simultaneously uniting.” (p. 160) His interpretation, however, is predicated on the assumption of an underlying generative structure, and that Berber individuals conform to it unflinchingly when they design their houses. Although he discusses the experience of the individual who reads the space as he or she moves through it on a daily basis, Bourdieu does not consider that the domestic space may have multiple layers of meanings for different members of the household.

The division between public and private space, or ritual/ceremonial space versus secular/quotidian space, has traditionally been a common concern in the symbolic analysis of households, but many scholars now question the validity of the dichotomy itself (Hendon 1996; Allison 1999; Robin 2003). They note that the binary concept of public and private, with their concomitant associations of male and female, is a Western assumption that has been applied uncritically to archaeological households. As Hendon (1996) argues, “cross-cultural studies of gender have undermined the domestic/public opposition as universal or even particularly meaningful.” (p. 47)

A more nuanced approach to the symbolic analysis of households can be seen in the study of domestic ritual. Allison (1999) makes the case that by separating routine and ritual, and

reserving the former for the domestic space and the latter for the public, household rituals often go unrecognized. Robin (2003) discusses the importance of 'commoner' ritual in the Maya region, such as burial and ancestor worship, feasting, dedication and termination, maintaining that these activities are evident in the material remains of every day life and ordinary objects. Meadows (1999) describes ritual eating and drinking in households in Early Roman Britain, using ceramics, bones, and plant remains to assess the impact of Roman imperialism on native settlements. According to Walker and Lucero (2000), state and royal rituals in the Maya lowlands and American Southwest may have even begun as traditional household rituals selectively appropriated by rising leaders towards their own interests. Hastorf (2003) similarly discusses the blurred manifestation between these categories regarding the Formative times in the South Central Andes.

### The Domestic Economy

Since Sahlins introduced his model of the domestic mode of production, the domestic economy has been another central concern in household archaeology. Analysis of domestic spaces have been used to address questions of labor scheduling and the allocation of resources. Drennan (1988), for example, investigates household labor organization under different agricultural systems by contrasting nucleated and dispersed residences in the Maya highlands and lowlands. Production and consumption practices have become a central focus for many researchers interested in the domestic economy. Hendon (1996) examines food preparation as an example of "the importance of household-focused production for the organization of domestic labor." (p. 50) In her view, food preparation and other production practices aimed at satisfying needs within the household are often overlooked in favor of household-based production for the larger society. She argues that studies of this latter type of household production, such as domestic craft specialization, have tended to focus on the household "as a place where production occurs, as a means of organizing production, and as a level of output," (p. 52) rather than considering the effects of such production on the household itself. Allison (1999) claims that production in either form traditionally has been privileged over consumption, because the two processes have been viewed in a hierarchical scheme. Rather than seeing consumption as the logical outcome of production, she proposes that consumption is an active agent in the process of production, and discusses ways in which household consumption can be recognized in the archaeological record. In her study of ritual eating in Early Roman Britain, Meadows (1999) uses artifacts and material remains to explore consumption practices of "households without the aid of houses" (p. 101) at sites with poor preservation. In the Wanka region of Peru that is also the subject of this study, Costin and Earle (1989) examine changing patterns of household consumption as evidence of economic and political strategies implemented by the Inka in their efforts to control the region. Hastorf and D'Altroy (2001) likewise argue that the study of household consumption, including how it relates to systems of reciprocity, redistribution and exchange and the dynamics of wealth, power, and decision making, can act as a bridge between the domestic and political economies.

### Daily Domestic Practice

Finally, household archaeology is concerned with the activities of domestic life. According to both the behaviorist and social practice approaches described above, a household is

defined by what its members do. These activities have significance for understanding the role of the household within the larger social, economic, and political organization, as well as the differing interests and agendas of its members. Household activities lend themselves well to archaeological investigations, because as Wilk and Rathje (1982) point out, “households live in and use material culture.” (p. 618)

Household archaeology has made a significant contribution to archaeological method and theory through the development of techniques to identify, characterize, and interpret activity areas. The spatial patterning of artifact assemblages recovered from floors and other domestic contexts may be used to reconstruct the activities of daily life that were performed by the members of the household (Sheets 1998; Kent 1984; Hendon 1989; Carr 1984; Kroll and Price 1991). These activities, such as craft production and food preparation, potentially shed light on the role of the household within larger social, political, economic, and religious structures, as well as the diverse affiliations, interests and actions of different members of the household. There is rarely a direct correspondence between the activities performed in a particular location and the artifacts that are left behind, however, because material remains are subject to a series of natural and cultural transformations (Schiffer 1983.) La Motta and Schiffer (1999) detail the formation processes pertinent to the life history of a domestic structure, and suggest a model for interpreting household floor assemblages in this light.

Ethnoarchaeological studies have been helpful in identifying patterns of remains that may be characteristic of various household activities (Kent 1987, 1990; Fernández et al. 2002; Sikkink 1988, 2001). Archaeologists must be cautious, however, when using ethnographic analogies because “traditional” practices in contemporary households may be quite different from the activities of ancient domestic groups, especially in areas that have been impacted by European colonialization (Stahl 1993). Recent research in soil chemistry in both archaeological and ethnographic households has demonstrated that repetitive, spatially circumscribed activities can leave characteristic chemical signatures, which can provide an informative complementary data set to floor assemblages (Fernández et al. 2002; Parnell et al. 2001; Parnell et al. 2002; Smyth et al. 1995; Terry et al. 2000; Wells et al. 2000). Excavations in uniquely preserved houses at several different sites also provide a rich opportunity for activity area analysis, as well as a source of analogy to structures that have been subject to more typical transformation processes. (Sheets 2000; Inomata and Stiver 1998; Tourtellot 1988; Webster 1989; Chase and Chase 2000).

### **Intrahousehold Organization**

Social practice approaches to the household have led researchers to focus on changes and variations within households rather than simply viewing them as irreducible units in a socio-economic network. Households comprise diversity both in their membership and in their physical spaces over time. Members of a household are likely to vary by gender, age, economic activities, and other corporate affiliations; rather than a single, static unit, a household may be comprised of multiple, competing interests and dynamic alliances among its members (Robin 2003; Hendon 1996; Allison 1999; Pader 1993). Gender issues in particular have received increasing attention by researchers interested in the diversity of lived experiences in ancient households (Joyce 1993, 2000, 2001; Tringham 1991; Hastorf 1991; Beaudry-Corbett and McCafferty 2002; Hendon 1997). Moreover, the membership of households may change over

time or even with social context. Haviland (1988), for example, presents an extended family model for a lower-class group of residences at Tikal. Although a household may have begun as a nuclear family in a single structure, rooms were added as the family grew. Upon the deaths of family heads in each generation, physical changes were made to the structures and family members reorganized themselves, redefining the household and its membership.

As Haviland notes, domestic structures as well as household members change over time. Buildings may not have been continuously occupied, or they may have been used by unrelated households at different points in time. Houses often have life cycles that follow the development of the household; old houses may be burned or destroyed and new ones constructed in their place (Tourtellot 1988; Tringham 2000). The use of space within a house also may change throughout the family cycle, year, season and day (Bourdieu 1970; vom Bruck 1997). By recognizing these dynamics within the household and the house, researchers have added layers of complexity to household archaeology and have enhanced its potential for interpreting the past. Such an approach calls for intensive data collection in domestic structures, coupled with detailed, contextual analyses that relate patterns of deposition to architectural spaces as they are modified over time.

### **Suprahousehold Organization**

Another fruitful line of inquiry in household archaeology has been investigations of the ways in which the individual household articulates with larger social, political, economic, and religious networks. Robin (2003) frames this focus on suprahousehold organization in terms of agency and constraints: while the members of a household were active participants in their lives, they were also constrained by the social, economic, political, and environmental structures within which they lived. By examining the ways in which households articulate with each other, their communities, corporate structures, and the state, household archaeology may contribute to our understanding of the interplay between structure and agency.

### Status, Power, and Wealth Distinctions Among Households

Many investigations of archaeological domestic structures have focused on distinctions among households in status, power, and wealth. Often these attributes are taken to be correlated with household size, construction quality, possessions, and luxury goods (Netting 1982; Chase and Chase 1992; Smith 1987), but it is important to define the categories in such a way that an analysis of the differences is not circular. Moreover, it is important not to conflate these three terms: status, power, and wealth may vary independently of each other, and their relative importance may differ according to the context (Orser 1988). One way in which household archaeology has highlighted these distinctions is simply by giving increased visibility to the lives of “commoners,” who are less likely to be represented in public architecture, art or texts (eg. Webster and Gonlin 1988; Lohse and Valdez 2004; Arroyo 2004). Robin (2003) discusses the importance of household archaeology in revealing the “*hidden transcripts*, the social perspectives developed by members of society through lived experiences” (p. 335) of the Classic Maya. She notes that studies of domestic group have demonstrated diversity among the class collectively termed “commoner”, and drawn attention to the roles of local leaders and multiple levels of political power. Brumfiel (1992) likewise cites the importance of household

archaeology in deconstructing a systems theory model in which commoners are seen as passive and only the nobility are granted agency. Marcus (2004) questions the validity of the commoner/elite dichotomy, calling for more extensive excavations that would help researchers better characterize the variability across these groups.

Many investigations of distinctions among households have focused on differences in diet. Lentz (1991) compares plant remains recovered from high and low status Maya residential structures. He finds that the high status structures contained a higher diversity of edible plants, from which he infers that the lower classes may have had inadequate access to nutrition. Chase and Chase (2000) examine floor assemblages from the rapidly abandoned epicentral royal structures at Caracol, as well as stable isotope data from burials, to find that the residents enjoyed a rich and varied diet, high in protein from maize and meat. The prevalence of storage containers and lack of cooking vessels suggest that food may have been supplied to the palaces from central kitchen, and “Caracol’s epicentral elite may have constituted a ‘super’-household, even though they were distributed in several palaces, presumably represented several different families, and may not all have been part of the royal court.” (p. 74) Members of noble households outside of the epicenter also appear to have consumed the same royal diet, indicating a further connection among different residential groups based on eating practices (Chase and Chase 2001). In Hawaii, Kirch and O’Day (2003) examine four different household complexes, distinguished in status by their architecture, size, lithic and faunal assemblages. They find that elite households had greater access to fatty or greasy flesh foods, identified by the ethnohistoric record as prestige items, while contrary to ethnographic tradition, commoners’ diets appear to have included an indigenous species of rat.

Other investigations of household differences in status, power, and wealth have focused on household production and consumption practices and elite patterns of extraction. Two examples from the Andes illustrate this. Topic (1982) found that in the urban center of Chan Chan, metal and textile production for elite consumption was located in low-status households. These households appear to have prepared food for their own consumption, but in contrast with specialized crafts, there is little evidence of food production. Class stratification is also evident from the artifact assemblages recovered by Kolata (1986) in platform mounds and smaller habitation mounds associated with agricultural fields at a Tiwanaku site. He argues that while the residences of the smaller habitation mounds were the primary agricultural laborers, “the construction, maintenance, and production of these fields were managed by a centralized political authority that systematically co-opted land and labor for the benefit of non-local populations.” (p. 760)

### Corporate Groups and “House Societies”

Another line of investigation has examined the ways in which households are connected through larger social structures. Patterns in household material culture may be more evident when individual residential units are considered as part of larger corporate groups (Hayden and Cannon 1982). Kinship studies have often seen households as family units, as described above, and this line of thinking would suggest that different households may be linked through their kinship or lineage relations. In their edited volume, Carsten and Hugh-Jones (1995) reintroduced Lévi-Strauss’s concept of “house societies” as a fluid yet extant entity that is often linked to a symbolic house. Joyce and Gillespie (2000) likewise propose a model of “house societies,” in

which many households may be part of a corporate group termed a house, which is organized by a shared set of activities and estate. According to Gillespie (2000a), “Houses define and socially reproduce themselves by the actions involved with the preservation of their joint property, as a form of material reproduction that objectifies their existence as a group and serves to configure their status vis-à-vis other houses within the larger society.” (p. 2) The relationships of house members may be expressed in the language of kinship, but this is due to a purposeful construction of affinity rather than recognition of biological relations (Gillespie 2000b). Kirch (2000) explores how the “house society” concept might apply to Oceania, demonstrating that as a dwelling place ages and becomes associated with the ancestors, it is turned into a sacred temple space. His excavations of Polynesian temple sites may be thought of as a type of household archaeology as they revealed evidence of domestic habitation predating their ritual use.

The *ayllu* is an important corporate structure in the Andes that has been described ethnohistorically and presents its own specific challenges for archaeologists. An *ayllu* is a group, like Lévi-Strauss’s house, based on real or fictive kin-relations; its members have common ancestors and sacred places, share resources, and often engage in the same trade and socio-economic roles. But *ayllus* exist at nested levels of organization, with people maintaining multiple affiliations to *ayllus* at different scales. According to Janusek (2002), “*ayllu* conjured an intricate and flexible sense of place and identity, but it also condensed complex relations in a hierarchical sociopolitical landscape, bestowing on them intimate family terms.” (p. 37) This flexibility makes the *ayllu* particularly difficult to characterize archaeologically (Nash 2009). The *ayllu* is presumably made of multiple households, but one household might belong to more than one *ayllu*, and its members may even have different affiliations. One approach to recognizing the role of *ayllu* social organization in household archaeology has been by way of Murra’s (1980) model of verticality, or zonal complementarity. According to this model, groups of households in different ecological zones may belong to the same *ayllu*, retaining ties to their home communities and producing resources for their benefit. Stanish (1989) uses the form and organization of domestic architecture as an indicator of ethnicity, or possible ties to *ayllu* groups that spanned ecological production zones. He argues that while many household activities and artifacts reflect the local environments in which the households lived, the architectural plans and fineware ceramics are more variable and reveal affiliations with extra-local groups.

### Households and the State

Finally, household archaeology has examined the ways in which households articulate with state-level organizations. Rice’s (1988) excavations of domestic structures in the Peten before and after the Classic Maya collapse provide insight into the changes that were brought on by the regional social and political upheaval. Other studies have documented transformations that took place in domestic organization as households were integrated into larger political economies. Meadows (1999) evaluates the impact of Roman imperialism on native British society, rejecting simple markers of “romanization” versus “native continuity” in favor of a more nuanced analysis using household artifact assemblages indicating consumption practices. Of particular relevance to this study, Costin and Earle (1989) examine how Xauxa household consumption patterns change with the Inka conquest. They find that, while social stratification among the Xauxa households becomes less striking under Inka rule, elite prestige wares move from local styles to the adoption of Inka motifs.

## **PRACTICE THEORY**

According to a theory of practice, daily life consists of actions that are shaped by underlying structures, but which simultaneously transform these structures. In this view, cultural practices “are predicated upon, and embody within themselves, the fundamental notions of temporal, spatial, and social ordering that underlie and organize the system as a whole” (Ortner 1984:154). Practice theory draws on Bourdieu’s (1977, 1990) concept of “structuring structures” and Giddens’ (1979, 1984) “theory of structuration”. Although practice theory originally grew out of cultural anthropology and sociology, archaeologists have found that its focus on day-to-day routines and their material expression makes it particularly applicable to archaeology, especially a contextual archaeology focused on the domestic sphere.

Bourdieu (1990) presents a concept of *habitus* as a set of cognitive and bodily knowledge, or a “system of structured, structuring dispositions” (p. 52). By this he means that experiences ingrained in people’s mental and physical awareness structure how they conduct their lives and themselves are structured by practices. According to Bourdieu, that which is taken for granted, or *doxa*, represents a realm of possibilities that a person accepts into his or her implicit worldview (1977:168). While *habitus* reflexively challenges, adjusts, and reinforces itself, *doxa* constrains the actor to the boundaries of a universe that “goes without saying because it comes without saying” (1977:167). Giddens (1984) emphasizes a concept of agency. An agent’s actions arise out of unacknowledged circumstances and have unintended consequences, and an agent is continuously engaged in reflexive monitoring (p. 5). “Structuration” represents the intersection between structure and agency (p. 16). While Bourdieu provides archaeologists with the theoretical tools to examine social organization and culture based on material manifestations of daily practices, Giddens contributes a diachronic dimension and a concept of agency that allow archaeologists to consider change over time and the role of individuals.

### **Case Studies**

Several case studies illustrate the use of practice theory to address questions of social identity and ethnicity, as well as to larger-scale social and political processes.

#### Practice and Social Inequality

Donley-Reid (1990) draws on Bourdieu’s structural analysis of meaning and symbolism in houses (see, eg., Bourdieu 1970) in her application of practice theory to the Swahili house. Architecture and space, she argues, play an active role in creating social systems of inequality. The durable, fortress-like exterior of Swahili houses helped create a social identity for these Arab traders with African wives; the house literally helped “make the Swahili middlemen” (p 124). The interior relations between objects and space helped create and reinforce systems of power and inequality. The house therefore symbolically represents a model of society; it is a material expression of hierarchies. As people move through the space of a house, they reinforce and recreate a bodily knowledge of social divisions and control. Donley-Reid describes the a ritual performed by female members of a household when a child was born: “The baby was taken

around the house and in each area the child was told who slept there or worked there, what those persons owned, and what their relationship was to the child. The child of course understood none of this, but the women in the group learned or reinforced their rank and everyone else's" (p 120). She points out that this ritualized movement through the house, which established spaces as physical cues for understanding social relations, was especially germane for the assimilation of African women into Swahili urban culture.

### Practice and Ethnicity

While Donley-Reid uses practice theory to examine symbolism and social inequality, Jones (1996, 1997) adopts a practice approach to ethnicity. Jones points out that using archaeology to identify ethnicity is nothing new: "Throughout the history of archaeology the material record has been attributed to particular past peoples, and the desire to trace the genealogy of present peoples back their imagined primordial origins has played a significant role in the development of the discipline" (1997:1). But while culture-historical approaches sought to correlate "bounded uniform cultural entities" (1996:446) with particular peoples, the late 60's and early 70's saw a shift in the definition of ethnicity towards an emphasis on the self-identification of the social actors involved. Jones takes issue, however, with the instrumentalist approaches to ethnicity roughly equivalent to the functionalist models of processualism. A practice theory of ethnicity, Jones proposes, will help to resolve "the relationship between agents' perceptions of ethnicity, and the cultural contexts and social relations in which they are embedded" (1996:450).

Jones draws on Bourdieu's concept of *habitus* to explain how ethnicity is a fluid, dynamic and contested structuring principle in people's lives. "Manifestations of ethnicity are the product of an ongoing process involving multiple objectifications of cultural difference and the internalisation of those differences within the shared dispositions of *habitus*" (1996:452). The cultural traits people select to reinforce and define themselves become objectified as markers. Just as the women of the Swahili house ritually define the spaces that objectify their social relationships, people make their routines and objects of daily lives a manifestation of their ethnic identification. Jones cautions, however, that ethnicity may not be visible in the archaeological record. Ethnic identity is not the product of "abstract categories of difference" (1996:453), but rather it is situated in the particular practices and cultural concepts of groups in different temporal and spatial contexts. By examining the case of Romanization in Britain, Jones demonstrates how the archaeological concept of ethnicity still relies on a culture-historical framework, and "abstract cultural and ethnic categories remain a fundamental part of the conceptualization of the past in archaeology despite critiques of culture-history" (1997:38).

Lightfoot et al. (1998) use practice theory to explore the nature of culture contact from an archaeological perspective. Like Donley-Reid, Lightfoot et al. examine mixed-ethnicity households in which men and women negotiate their identities between each other and within the larger society. They do not address Jones' concern with imposing ethnic categorizations, but rather seem to define the ethnic groups involved based on their differing cultural practices as well as places of origin and language. Practice theory's focus on daily routines and activities lends itself particularly well to the study of culture contact, they argue. "In the process of culture contact, people will reconstitute and reinterpret cultural practices in ways that both make sense of 'others' and best suit their own needs" (p 201). By looking at the organization of external and

internal space, cooking and food preparation, and domestic material culture, Lightfoot et al. are able to trace ways in which members of the households negotiated their different cultural practices. “It is the detailed investigation of these kinds of daily practices,” they conclude, “undertaken in broadly diachronic and comparative frameworks, that will provide a more sophisticated ‘contextual’ approach for studying culture change and persistence in pluralistic settings” (p 216).

### Practice and Political Development

While Donley-Reid, Jones, and Lightfoot et al. emphasize the potential of practice theory to elucidate human social structures on a small scale, other scholars have attempted to explain larger scale processes from the standpoint of a theory of practice. Pauketat (2000) proposes a practice approach to political control and social order. He argues that large-scale processes such as political consolidation may be understood in terms of the daily reinforcements and transformations of practice. Just as daily routines helped to define social relations of inequality in the Swahili house, serve to objectify the material manifestations and bodily practices of ethnicity, and form the basis by which members of one cultural group negotiate change and persistence in the face of ‘others’, so too archaeologists can refer to daily practice to explain the development of political systems. Pauketat uses the case of Mississippian platform mound construction to argue that “the commoners were responsible for their own social position, at least in a historical sense” (p 114). He objects that traditional explanations for the creation of monumental constructions rely on the needs and actions of those in power and fail to “consider the effects of non-elite practices in social change” (p 117). In the case of Mississippi platform mound construction, the consolidation of political power in the hands of a few can be seen in the tradition of Giddens as an “unintended consequence” of activities in which the non-elite chose to engage. The difference, Pauketat claims, rests at first simply in a change in the scale of the practices.

Roscoe (1993) likewise argues for an application of practice on a more grand-scale theoretical level in anthropology. Cultural anthropology, he claims, has avoided theories of political evolution, leaving this to the realm of archaeology. Such a remarkable phenomenon, however, demands the attention of the discipline, and practice theory provides a way to construct both material and non-material explanations for political processes. “The aspect of practice theory bearing most directly on political centralisation is its treatment of power and domination,” (p. 113) Roscoe claims. He discusses Giddens’ concept of relational power as “power to,” or the power “to do things or get things done.” (p. 113) This is particularly pertinent to understanding political centralization and its manifestations in terms of effectiveness, extent and institutionalization. Roscoe concludes that not only does practice theory seem “better able to account for the multiplicity and complexity of the conditions, contingencies, and trajectories involved in political evolution,” (p. 123) but that such an approach allows “the data” to include the ethnographic record as well as the archaeological one.

### **FOODWAYS**

Food is essential to life, and food-related activities comprise a large part of daily practice. Foods—their production, acquisition, storage, preparation, serving, and consumption—are

imbued with meanings that both shape and are shaped by culture. This study uses plant remains to explore some aspects of Xauxa food-related practices before and after the Inka conquest, arguing that political changes played out on the household level through decreased local feasting activities. This section briefly reviews some anthropological approaches to the significance of food in society and challenges some assumptions that are often made about what food is and is not. The section ends with an examination of feasting as a food-related practice that is particularly fraught with social, political, economic, and ideological significance, presenting a context from which to understand the importance of the changes evident in Xauxa household feasting.

## **Food Beyond Subsistence**

Foodways entail all of the things involved in food beyond merely eating to stay alive. Much work in anthropology has been done to explore the role of diet, nutrition and energy in the formation of culture and social change (e.g. Fischler 1980; Grivetti 1978; Harris 1974; Shack 1969), but this study is more concerned with the activities, attitudes, beliefs, and rituals that surround what we eat and how we eat it.

### The Meal as Metaphor

Just as households and their associated remains lend themselves to the symbolic interpretations discussed above, food and cooking have provided rich material for structural analysis. Lévi-Strauss (1968) uses cooking as an example to demonstrate a linguistic model of cultural analysis. Echoing the “vowel triangle” and “consonant triangle,” he says, is a “culinary triangle,” with three points corresponding to the raw, the cooked, and the rotted, that represents the fundamental opposition of nature and culture. To get from the raw, or the state of nature, involves a transformation: cultural towards the cooked in one direction, and natural towards the rotted in the other. This fundamental semantic structure, he argues, can be elaborated for any particular culinary system. Douglas (1975) builds on Lévi-Strauss’s approach to “decipher” a meal, but criticizes him for focusing overly much on the universal meanings rather than the significance of the particulars and variations. She rejects his binary analysis in favor of a more iterative interpretation, proposing that “each meal is a structured social event which structures others in its own image.” (p. 44)

While Lévi-Strauss and Douglas examine the components of a meal, Hugh-Jones (1978) takes the process of cooking as the subject of her structural analysis. She argues that the imposition of culture on the natural world can be seen in the sequence of actions involved in cooking as well as in the ingredients, and that the significance of this metaphor is evident in other spheres of society. Weismantal’s (1988) ethnographic study of foodways in the Ecuadorian Andes represents a more significant departure from Lévi-Strauss’s brand of structuralism. Like Douglas, Weismantal is concerned more with the particular than the universal, and she uses food and cooking to “demonstrate the interaction of structure, discourse, and practice.” (p. 12)

## Food and Identity: We Are How We Eat

Food is a form of cultural expression, and many scholars have explored the ways in which social roles and identities are negotiated through food (eg. Twiss 2007a; Fischler 1988; Lupton 1994; Ohnuki-Tierney 1993.) Twiss (2007b) argues that food “is an unusually powerful symbol of identity because foodways involve both the performance of culturally expressive behaviors and the literal incorporation of a material symbol.” (p. 2) Food and foodways therefore lie at the nexus of practice and material culture, offering rich interpretive possibilities to archaeologists and anthropologists concerned with the construction and contestation of social identity. The following studies illustrate a number of different approaches that researchers have taken to the role of food in social identity.

Appadurai (1981) introduces the concept of “gastropolitics,” examining the symbolic function of food in establishing social relations in South Asia. He argues that food plays two related but opposing roles: it can be used to unite people on common ground, but can also be a vehicle for making distinctions in status or power. He demonstrates that the exchange of food in one domain, such as the household, carries with it meanings from similar transactions in other domains, such as the wedding feast and the temple. Social actors therefore negotiate their roles through food as a multivalent tool.

Weismantel (1988) discusses the importance of food-related activities in the formation of social identity and ideology when traditional practices are contested. While social and political ideologies may be given public voice in the town plaza, she emphasizes the critical role of “kitchen life” in establishing these ways of thinking. Kahn (1986) investigates the ways in which villagers in Papua New Guinea construct their understanding of themselves and their social relations through the ways in which they think and act about food. She notes an apparent contradiction between a culture of scarcity and the ecological reality, arguing that food serves a symbolic role tied to a prevailing cultural concern with control. Just as biological hungers must be restrained, so eating becomes a social expression of relationships of gender and power. Other researchers have explored the ways in which food taboos construct social meaning (Faithorn 1975; deBoer 1987.) Food as a substance can carry with it transformative properties, especially when it crosses boundaries of social categories. Meigs (1983) describes how the Hua of Papua New Guinea experience the life essence of the person who produced the food when they eat it. Such powerful potential necessitates elaborate food-related rules, which she demonstrates may be either absolute or relative, changing as people ages and reconfigure their roles within the larger society.

Food preferences can also be important in establishing social cohesion and a collective sense of identity (Hastorf and Johanessen 1993; Gumerman 1994; Meadows 1999.) Smith (2006) stresses the importance of every day food choice at the household level in the creation of social ideology and large scale production. She uses textual and archaeological evidence from South Asia to demonstrate how the social and ritual significance of rice resulted in a consensus-based mode of agricultural intensification. “The ideology of food consumption as a component of daily life was practiced at all levels of the social hierarchy,” (p. 488) she writes, and although the cultivation of rice is labor-intensive, “the ability to produce and consume rice enabled ordinary rural dwellers to feel as though their status had been elevated.” (p. 489)

## The State at the Table: Political Economy of Food

Just as food is a potent vehicle for social negotiation, it can be an important instrument of the political economy. On a grand scale, Mintz (1985) describes how the production and consumption of sugar has articulated with the modern capitalist distribution of power. Allison (1991) takes a more intimate view of state power vis-à-vis food, using Althusser's (1971) concept of the Ideological State Apparatus to portray the Japanese nursery school lunch-box, or *obentō*. The preparation and consumption of the *obentō*, she argues, constitutes an ideological indoctrination for both the mother and the child regarding their roles in Japanese society. "Food in this context is neither casual nor arbitrary..." she writes, "both the mother and child are being watched, judged, and constructed." (p. 296)

Foods may become imbued with value through an investment of labor in their preparation, and the control of that labor and its products can have political implications. Hastorf and Johannessen (1993) trace the changing role of maize in the Mantaro Valley from a simple boiled food to a highly charged symbolic alcoholic beverage. Brewing *chicha*, or maize beer, is a time-consuming process. Leaders who have the ability to summon the necessary labor to produce large quantities of *chicha* can host public feasts, which will establish and reinforce their social and political power.

### **Problematizing "Food"**

Cooking and eating are socially structured processes, and food itself is a cultural construct. What is considered inedible and what is thought desirable may vary dramatically with social context, just as the definition of food and drink does not overlap with everything that is eaten or swallowed. While contemporary Western thought makes an explicit distinction between food and medicine, that dichotomy becomes blurred in practice within the realm of nutrition, and simply is not relevant for many other foodways. Anderson (1988) describes the medical values of food in traditional Chinese thought. The qualities of substances that act as food and medicine have parallels in cosmology, and their actions are understood through humoral theory. Foods with medicinal properties are used daily, and changes to diet are often the first response to illness. The Hausa of Nigeria have a very different traditional medical system, but they take a similar approach to food as medicine (Etkin and Ross 1982.) Their cuisine is based on values of food in terms of their effects on the body, and in this way every meal is potentially healing.

The definition of food itself also depends on cultural context. While domesticated crops are often featured as staple foodstuffs, wild plants have also played a very important role as food and medicine (Etkin 1994.) Messer (2007) explores the cultural categories that define the edible and the inedible, and how these constructs may apply to new foodstuffs such as genetically modified maize and microbial food products. Eating the flesh and bones of another human may be unthinkable in many societies, but Conklin (1995) presents a moving analysis of cannibalism as a part of funerary rituals in the Amazon.

As Fritz (2007) points out, the cultural perspectives of modern archaeologists invariably shape their approach to archaeobotanical remains, and may prevent them from recognizing the importance of certain plants as food. Chapter 4 of this study discusses how the botanical remains analyzed were classified as either "food-related" or "non food-related." Although this division is necessary for the statistical analysis, it is important to remember that these categories are a

construction based on a consideration of the issues outlined above and the best available evidence for the ethnobotanical role of each plant item.

## Feasting

Food takes on another layer of significance when it is considered in the context of feasts. Feasting brings together both the aspects of performance and materiality that are inherent to foodways. Food is produced, prepared, and stored for feasts at which it is presented, consumed, and discarded. Anthropologists and, increasingly, archaeologists have recognized feasts as an important site for the negotiation of power, establishment of community relationships, mobilization of economic resources, and creation of social identity.

What constitutes a feast is not necessarily straightforward. Dietler and Hayden (2001) note while that each of the contributors to their edited volume on feasting present a slightly different working definition, all agree that feasts are characterized by the “communal consumption of food and/or drink.” (p. 3) Other aspects central to the feast may include the size of the gathering, the relationships of the participants, the role of ritual, and its distinction from everyday meals. Some authors have emphasized the presence of luxury foods at feasts (van der Veen 2003, 2007b; Arthur 2003), but others have demonstrated that feasting may involve everyday foods, present in large quantities or prepared in more labor-intensive ways (VanDerwarker et al. 2007; Hastorf and Johannessen 1993; Leach 2003) While Dietler (2001) emphasizes that it is the ritual nature of feasts that give them their particular social significance, Hayden (2001) argues that ritual may not be central to some feasts, and other highly ritualized eating activities are not feasts. Many researchers have defined feasts in contrast with everyday meals, but Twiss (2007c) proposes a more dialectical relationship between the two forms of food consumption. Hastorf and Weismantel (2007) suggest that the difference between the everyday meal and the feast is significant but culturally constructed, and therefore should be inferred from the data rather than assumed *a priori*.

Feasting can happen in a multitude of different ways. In an effort to develop a theoretical framework with which to approach feasting, both Hayden and Dietler present classification schemes for different types of feasts. Hayden (2001) discusses a variety of ways in which feasts can be categorized. Of these, he argues that the traditional emic, or symbolic, typology (such as wedding feast, funeral feast, harvest feast) is the least helpful for archaeologists. He advocates for the development of archaeological categories based on patterns of material remains; but since sufficient data for that is currently lacking, he outlines a functional classification of feasts consisting of two main types: 1) feasts that create social cooperation or distinction (including solidarity, reciprocal, political support, and promotional feasts), and 2) feasts that create economic benefits (including competitive feasts and feasts to acquire political position.) While Hayden emphasizes the universal practical benefits of feasts, Dietler (2001) takes a more contingent, practice-oriented approach. Maintaining that feasts are inherently political, he describes three modes of “commensal politics”: 1) *Empowering feasts* are for the acquisition of social power or symbolic capital. They are inclusive, although predicated on the creation of social distinctions, and are distinguished from everyday meals by their quantity of food. 2) *Patron-role feasts* are used to maintain and reinforce pre-existing power inequalities. In other aspects, they resemble empowering feasts. 3) *Diacritical feasts* also serve to reify social and political distinctions, but unlike patron-role feasts, they are exclusive, establishing a narrative of

us-versus-them. Also unlike the other two types of feasts, they are distinguished by the quality of food or the context of its presentation, rather than simply its abundance. Both of these classification systems have informed subsequent research on archaeological feasting. As discussed in more detail below, these different types of feasts may vary in their ingredients, containers and tools, and their use of space. Such differences in material expression may be used to build archaeological correlates for Hayden and Deitler's classification schemes.

### Practice, Social Identity, and Politics in Feasting

Many approaches to feasting have emphasized issues of social identity, including gender and labor relations. Bray (2003a) discusses the importance of "engendering" the study of feasting and power relations, noting that although women tend to do the bulk of the work to prepare food for a feast, men are usually the primary recipients of the social and political capital. Smith (2003) highlights the role of individual agency at the frontiers of the Egyptian imperial state, using evidence from feasting assemblages to argue that despite an official ideology emphasizing their distinctions, Egyptian colonists and indigenous Nubians did in fact interact and possibly even intermarry. Feasts require long term planning, with a greater quantity and different tempo of labor, to produce and prepare the food, as well as possibly also the construction of special structures for the event. Hastorf (1991) discusses the role of women's labor in the food processing necessary for feasting, arguing that with Inka imperial rule, the activities of Xauxa women became more circumscribed as the demand for their labor intensified. While some families may work for a long time to host a feast, as Dietler (2001) points out, most foods could not be prepared and stored for long periods of time, and therefore a large labor force would be needed immediately before a feast. Studies such as Jennings' (2005) analysis of the energetics of feasting suggest the impressive scale of labor investment necessary for feasting in the Andes. The ability of one household to mobilize labor from other households for a feast may be part of the creation and maintenance of social relations and power. Brown (2001) notes that the presence of worn metates without matching manos at a household compound at Cerén in which preparations for feasting took place suggests that women from other households came there with their own manos to contribute labor.

Just as a great deal of labor is needed to put on a feast, feasts can be given in exchange for labor. Dietler and Herbich (2001) describe work feasts used to mobilize large voluntary labor forces. Unlike work exchanges, which entail reciprocal labor-related obligations to be fulfilled at a later date, work feasts can be an effective means of immediately discharging obligations to a very large number of laborers. They discuss ethnographic examples of work feasts in Africa, and similar work-party feasts have been described in the Andes in both modern and prehistoric times (Hastorf and Johannessen 1993; Jennings 2005; Vaughn 2004; Lau 2002).

As Dietler's three modes of commensal politics indicate, feasts can be critical in the negotiation of power, status, and wealth among households, lineages, and corporate groups. Feasts often simultaneously build a sense of community solidarity while creating or emphasizing distinctions in the social fabric (van der Veen 2007b; Lev-Tov and McGough 2007; Lewis 2007). The form and purpose of feasts may vary dramatically with different sociopolitical contexts. Kirch (2001) evaluates feasting in three different Polynesian societies: a "traditional" chiefdom, a midrange "open" society, and a complex, stratified chiefdom. As the nature of the feasts change from kinship based and religious, to competitive for political gain, to diacritical, he

finds that the role of material culture becomes increasingly marked and the activities become more visible archaeologically. House societies and other lineage-based groups were discussed above as a form of supra-household organization; these corporate groups also use feasting as a means to define themselves and consolidate their political power (Hendon 2003; Pollock 2003.)

Feasting is also important in state-level politics and the formation of empires. As Dietler (2001) notes, the study of feasting can be a rich arena for social archaeologists because it allows for a practice-oriented approach to questions of political structure and development. While most researchers have used practice theory to highlight the importance of smaller scale processes, we have seen how Pauketat (2000) and Roscoe (1998) have called for the application of practice theory to understand large-scale political changes. The activities encompassed by feasting may serve as a bridge to understanding the political economy from a practice-based perspective. Bray's (2003c) edited volume *The Archaeology and Politics of Food and Feasting in Early States and Empires* seeks to do just this, examining the state-level political dynamics of feasts in both the Old and New Worlds. As Dietler (2003) points out in his concluding remarks to the volume, even in societies with institutionalized structures of authority, political power is constantly challenged and negotiated, and so the role of the commensal politics of feasting is just as complex and multifaceted.

### Archaeological Evidence of Feasting

Feasting is an activity rooted in materiality. The material remains of feasts, however, are often not straightforward to interpret in the archaeological record. Evidence of feasts may be seen through their ingredients, containers and tools, and use of space. As discussed above, the food served at feasts may differ from that of everyday meals in abundance, preparation style, or the presence of rare luxury items. Detailed analysis of floral and faunal remains can reveal the locations of concentrations of food-related remains, variations in processing techniques and cooking styles, and special plants, animals, or cuts of meat that were used. Food remains from feasts may not correlate directly with consumption, however, and deposits of botanical and faunal remains related to feasts would more likely be located in areas of preparation or waste disposal. This study focuses on a paleoethnobotanical approach to the study of foodways, and Chapter 4 gives a more detailed review of the considerations necessary for interpreting plant remains in the context of feasting and food-related practices. Ceramic and lithic analyses can also be important for identifying and characterizing feasting. The greater quantities of food served at feasts would require more or larger containers for storing, preparing, and serving the ingredients. The significance of the social performance of feasting discussed above may be reflected and reinforced by the quality and decorations of the vessels used to prepare and serve the food. Likewise, stone tools used for food preparation, such as the grinding stones or knives, may be of higher quality or present in greater amounts in areas in which feasts were prepared. Feasting practices may also be reflected in architecture or presence of certain features. Middens, storage pits, hearths, plazas, architectural motifs, and specialized structures may be shown to be associated with feasts. The deposition of botanical remains can reveal the characteristic set of activities involved in a feast, with uneaten food dropped or discarded at various points during the process of preparation, serving, and eating.

Hayden (2001) presents a detailed description of these material correlates and argues that it would be ideal to develop an archaeological, or material-based, typology of feasts. He

acknowledges that there currently is not sufficient data for such a classification scheme, but maintains that it would be the best way to link archaeological feasting with ethnographic practices. Dietler (2001), on the other hand, feels that it would be unrealistic to expect universal feasting signatures, but argues that researchers can develop meaningful material correlates based on specific cultural contexts. Both authors (Dietler and Hayden 2001) make a distinction between feasting as a process and feasts as an event, and they contend that although individual events may not be visible in the archaeological record, feasting as a social and political activity—like trade and agriculture—will leave characteristic material evidence.

Several researchers have demonstrated the ways in which culturally specific archaeological correlates can be used to identify and interpret feasting activities. Pauketat et al. (2002) use multiple lines of evidence, including ceramics, lithics, plant, animal, insect, and human remains, as well as sediments to reconstruct public feasting rituals at the site of Cahokia. Lev-Tov and McGough (2007) explore the dynamic interpretative relationship between material remains and texts at two Middle Eastern sites. They use cuneiform texts and a large faunal assemblage to identify religious feasting practices, with each line of evidence informing the other. van der Veen and Jones (2006) focus on taphonomic processes to reinterpret grain deposits in storage pits at hillfort sites in Iron Age Britain as supplies for communal feasts. Their argument challenges previous understandings of these pits, and emphasizes the importance of a careful and contextual analysis of the archaeological correlates of feasting, as well as the role of storage. Smith, Wharton, and Olson (2003) show how the relative proportions of vessel forms and sizes can be used to identify feasting in the Aztec empire in the absence of a specific state ceramic assemblage. They emphasize the particular importance of alcoholic beverages at Aztec feasts and the role of ceramics to identify their presence. VanDerwarker et al. (2007) demonstrate how multivariate analysis of plant remains can be used to identify feasting that is not distinguished by the presence of luxury items, but rather by subtle but significant differences in abundance and combinations. Such an analysis is particularly germane to this study, which will likewise demonstrate how a multivariate paleoethnobotanical approach can distinguish certain contexts that may be related to feasting activities.

### Andean Feasting and *Chicha*

Public feasts are an integral part of Andean culture today (Allen 1988, 2009; Isbell 1978). Historical records and archaeological evidence indicate that feasting likewise played an important role in Andean social and political life in the past. At the time of the Spanish conquest, chroniclers such Guaman Pomo and Spanish missionaries gave detailed accounts of Inka feasting practices, including the prominent role of fermented maize beer, or *chicha*. Such historical accounts of Inka feasts can be helpful in understanding pre-Inka feasting, but it would be a mistake to assume that these practices were static throughout the entire region and over hundreds of years. Recent archaeological research has begun to build a more diverse and detailed picture of different Andean feasting modalities for other areas and time periods, such as the Tiwanaku state and its hinterlands (Goldstein 2003; Anderson 2009), the Wari Empire (Cook and Glowacki 2003; Goldstein et al. 2009), the Chimu Empire (Moore 1989), and the Wanka region (Hastorf and Johannessen 1993).

As Jennings and Bowser (2009) argue, despite the differences there is also significant continuity in feasting throughout the Andes, and it can be profitable to consider the long term

structures that appear to underlie these practices. The concept of reciprocity is central to many aspects of Andean social and political organization, and feasts can be instrumental in creating relationships of mutual obligation, while at the same time establishing a social hierarchy. Andean feasts often take the form of the work feasts discussed above, in which food and drink are offered in exchange for labor. Alcoholic beverages, especially *chicha*, are often the cornerstone of Andean feasts. The term *chicha* can refer to a variety of indigenous fermented grain and fruit beverages. Goldstein et al. (2009) explain the multivalent nature of the word and how its meaning may vary by context or user. For the Inka, the predominant form of *chicha* was a maize beer, and it appears that the Xauxa likewise used maize to make a fermented beverage (Hastorf and Johannessen 1993). In this study, therefore, the term *chicha* will refer specifically to maize beer unless otherwise noted.

According to Hastorf and Johannessen (1993), maize *chicha* had particular symbolic import for the Inka and their predecessors because it represented three distinct transformations. First, the maize kernel was transformed into beer through a labor intensive process described below. Second, the intoxicating effect of *chicha* was transformative for the drinkers. And third, maize was unique among domesticated crops because it had no wild counterpart and so served as a powerful symbol of the transformative power of culture on the natural world. Such a highly charged substance played a key role in the Inka empire in mediating relationships between rulers and subjects (Bray 2003b).

Making *chicha* takes many days and is a labor intensive process. While there is a wide variety of recipes and techniques, certain aspects of the process are basic to them all (Moore 1989; Jennings 2005). First, the starches in corn must be converted to fermentable sugars. This can happen either by allowing the corn to germinate and then grinding it, or by grinding and then chewing the corn so that salivary enzymes break down the starches. Of the two methods, germination takes longer and is a more complicated process, involving soaking the grains, letting them sprout in the dark, and then drying them in the sun. Both methods result in a corn flour that is then mixed with water and boiled over low heat from one to three days. During this part of the process the mixture may be separated or strained, and flavoring ingredients may be added. At the end of the boiling stage, the product is poured into another jar where it cools and ferments for one to six days. The *chicha* must be consumed soon after the fermentation process is finished as it will generally go bad in less than a week. The mass production of *chicha* for public feasts, therefore, requires intensive work over many days; this work must be done by many people all at once rather than fewer people over the course of months because the *chicha* cannot be stored.

Moore (1989) uses ethnographic and ethnohistorical records of this process to develop archaeological correlates for *chicha* production at a Chimu site on the northern coast of Peru. He details the types of features, artifacts and products or by-products that may be associated with each step. His study demonstrates the potential that a careful analysis informed by culturally relevant material correlates has for shedding light on the nature of residential *chicha* production and its articulation with the political economy.

The labor required to make *chicha* for a feast also has important implications for gender dynamics in Andean society, since the work was primarily done by women. *Chicha* brewing can be a locus of power for Andean women since they control the storage of maize and the brewing process, but it can also serve to subjugate women's labor and constrain their social roles. Perlov (2009) describes how some contemporary female *chicha* brewers are able to make good profits and therefore a degree of power and autonomy, but they are more likely to support their sons'

educations with their earnings because their daughters provide valuable labor for the business. As discussed above, Hastorf (1991) argues that increased *chicha* brewing demands by the Inka on Xauxa households served to circumscribe women's activities, while the results of their labor were enjoyed by a smaller group of men. The Inka in fact further centralized *chicha* production, establishing groups of "chosen women" who were sequestered in special houses and taught to make cloth, *chicha*, and other goods for the state (D'Altroy 2002). As noted in Chapter 2, Spanish chroniclers described such a sequestered compound for the *aqllakuna* at the regional Inka center of Hatun Xauxa just south of the Yananmarca Valley. In their analysis of changing vessel sizes over time, Jennings and Chatfield (2009) maintain that this shift in *chicha* production from a domestic to a specialized activity brought with it a diminishment of women's power.

This study uses the distribution of plant remains to examine the social and political implications of feasting practices among the Xauxa of the Mantaro Valley. It builds on previous research (Hastorf and Johannessen 1993; Hastorf 1990, 1991; Costin and Earle 1989) that has described changes in feasting activities over time. Multiple lines of evidence indicate that there was a shift in maize use after Wanka I, with a marked increase in *chicha* production that corresponds to the dramatic political changes of Wanka II. As settlements moved from the valleys and the population concentrated in fortified hilltop sites, Xauxa leaders appear to have used feasts and *chicha* to consolidate their political power and control over local labor. Although maize production increased after the Inka conquest, and stable isotope data indicates that people ate more maize and meat, evidence for feasting in the Wanka III settlements is scant. Instead it appears that the Inka may have taken over the role of feast hosts from the local Xauxa leaders, thus reinforcing their authority and command.

## CHAPTER 4

### PALEOETHNOBOTANICAL METHODS

#### **Introduction**

Paleoethnobotany is the study of interactions between people and plants in the past. Plants have played an essential role in all aspects of human life throughout history: they have been farmed, fought over, exchanged, ingested, and inhaled; they have formed the raw materials for houses and baskets, medicines and fuel, weapons and meals. Meanwhile, humans exert appreciable influence on the lives of plants. Domestication has altered the genetic structure of thousands of plant species. People modify landscapes, encourage plants that please them, pull weeds, enrich or deplete the soil, induce erosion, introduce pollinators and pests, and endanger other animals whose lifecycles are intertwined with those of the plants.

Hans Helbaek (1959) first introduced the field of paleoethnobotany as a marriage of cultural historians and botanists. Since then, the methodology and interpretive framework of paleoethnobotany have become part of an anthropological archaeology. Jane Renfrew (1973) defines paleoethnobotany as the study of plant remains that had been cultivated or used by humans and were recovered at archaeological sites. Other researchers emphasize the dynamic nature of the relationship between people and plants. Ford (1979) defines paleoethnobotany as “the analysis and interpretation of the *direct* interrelationships between humans and plants for whatever purpose as manifested in the archaeological record” (p. 285, emphasis in original.) As Pearsall (2000) points out, there are two components inherent in this definition: first, paleoethnobotany is essentially archaeological but requires expertise in botany, and second, paleoethnobotany draws on an ecological approach, with increasing interest in social and cultural contexts. Hastorf and Popper (1988) emphasize this anthropological nature of paleoethnobotany. In their definition, “paleoethnobotany is the study of past cultures by an examination of human populations’ interactions with the plant world.” (p. 1)

Paleoethnobotanical analysis has become an important source of information in archaeological research. Botanical remains do not preserve as well as ceramics or lithics, and therefore traditionally they have not been considered staples of archaeological data. But systematic sampling and increasingly refined methods of recovery, coupled with a number of more sophisticated laboratory techniques, have helped make plant remains a significant data set in archaeology. Researchers have successfully applied botanical evidence to many different archaeological questions, from the more overtly plant-related, such as subsistence strategies and agriculture, to issues such as socio-political organization or economic relations, in which plants play a more subtle yet persuasive role.

This study examines botanical remains recovered from the UMARP excavations to investigate Xauxa foodways. This chapter describes how such a study is situated within a larger tradition of paleoethnobotanical analysis, giving an overview of its materials, methods, and interpretive framework. It begins with an explanation of techniques for collecting plant remains from archaeological sites and how those remains are identified in the laboratory. The chapter continues with a discussion of how botanical remains enter the archaeological record, and how post-depositional processes may affect their preservation and patterning. It then describes methods of analysis that are well suited for paleoethnobotanical data, and concludes with a review of the types of questions that can be addressed particularly well through a focus on plant remains.

## **COLLECTION OF PLANT REMAINS**

The first step in a paleoethnobotanical analysis is the systematic recovery of plant materials from their archaeological context. This study focuses exclusively on macroremains, which are botanical materials that can be recovered through flotation and identified with low-power microscopes. Other materials such as pollen (Fish 1994; Kelso et al. 1995; Hall and Ferguson 1996), phytoliths (Piperno 1988; Piperno et al. 2000; Rosen and Weiner 1994), starch (Ugent et al. 1981; Loy 1994; Piperno and Holst 1998), and organic residues (Evershed 1993; Evershed et al. 1990; Copley et al. 2005; Colombini et al. 2004; Regert 2004; O'Donoghue et al. 1996) can also comprise excellent paleoethnobotanical data sets, especially in areas with poor macroremain preservation, but the techniques specific to their recovery and analysis are beyond the scope of this study.

Prior to the systematic recovery of botanical materials, plants remains were collected haphazardly at archaeological sites, only when they were large or prominent enough for excavators to notice them. Their value as a data set therefore was minimal because, as it will be argued below, the informative power of paleoethnobotanical analysis rests much less on the presence of individual plants than on the patterns formed by their depositional contexts and amounts.

The need for systematic recovery is not unique in archaeology to botanical materials, and it is now standard procedure to screen all excavated soil. This allows for more systematic recovery of lithic, ceramic, and other materials, but dry screening is not adequate for macrobotanical collection. Occasionally plant remains are large enough and well preserved enough to be caught in a recognizable form on the screens, but much more often the remains are too small and fall through the screens, or they are so fragmented and dirty and it is difficult to distinguish them from the soil. Dry screen collections have overall low counts and are biased towards larger remains, so taxa with seeds smaller than the screens will be completely absent from the record (Wagner 1988).

The development of flotation has been seen as a “revolution” that radically changed the study of macrobotanical remains, allowing for systematic collection and greatly increased recovery rates (Wagner 1988; Chapman and Watson 1993). With this method, a measured volume of excavated soil is immersed in water and agitated. Organic remains and other small, light materials are freed from their soil matrix and float to the surface, where they are collected as the “light fraction.” Heavier materials will sink to the bottom and are collected on a mesh screen as the “heavy fraction,” while the rest of the soil is washed away. The two fractions can

be dried and examined for botanical remains. Streuver (1968) first introduced flotation techniques to archaeologists as a method for recovering many different types of small-scale remains, including plants. The type of basic flotation system that he described was adopted by many projects (e.g. Helbaek 1969; Bohrer and Adams 1977). Variations of hand flotation systems were subsequently developed (e.g. Minnis and LeBlanc 1976), as well as larger scale flotation machines, most notably at Ankara (French 1971) and Siraf (Williams 1973). In North America, researchers at the Shell Mound Archaeological Project (SMAP) designed a machine based on the Siraf and Ankara models that was fairly portable and could deal with more clayey sediments (Watson 1976). SMAP-type machines have formed the basis for flotation systems in many New World archaeological projects (Pearsall 2000:27). Tests of different flotation machines using a “poppy seed recovery standard” have shown a consistently high rate of recovery for SMAP machines (Wagner 1982).

It is rarely possible to float all of the soil excavated at a site, so systematic archaeobotanical recovery through flotation requires sampling (Toll 1988). Sampling strategies need to take into account sample size, locations, frequency, and method of collection. Van der Veen (1985) describes a method of determining the optimal sample size given different parameters. Lennstrom and Hastorf (1992) compare two different methods of sample collection at Pancán. Bulk samples, taken from a single location, and scatter samples, taken from across a context, generally produced similar results, but with some consistent differences, including a higher density and diversity in scatter samples. They conclude that, rather than applying each method to specific contexts, collecting the same type of sample throughout the site is better for quantitative comparisons. Sub-sampling is often necessary for laboratory analysis of the floated samples. Van der Veen and Fieller (1982) describe a method for determining how much of each sample should be sorted and analyzed, and compare techniques for getting a random sub-sample.

### **UMARP Collection Procedures**

The botanical data analyzed in this study comes from soil samples that were collected from the UMARP excavations in 1982 and 1983 (Earle et al. 1987; Hastorf 1990). One 6 kg bulk sample was collected from a discrete point-provenienced location for each provenience excavated. Bags of soil were measured before flotation so their volumes could be standardized. Soil samples were processed in a SMAP-type flotation system modified by Christine Hastorf and Anabel Ford in Peru. The light and heavy fractions were retrieved by geological screens of 0.5 mm and 6.35 mm respectively. The fractions collected were shipped to the Archaeobotany Laboratory at the University of Minnesota, where they were sorted and identified according to the procedures described below. Samples were not sub-sampled in the laboratory, but sorted in their entirety.

Botanical remains were also collected from the ¼ inch screens during excavations. As described above, this type of collection cannot be merged or directly compared with data from systematic recovery, but is treated in Chapter 5 as a complementary data set.

### **IDENTIFICATION OF MACROREMAINS**

In the laboratory, samples are sorted using a low-power microscope and macrobotanical remains are identified to family, genus, or species. Pearsall (2000:99-170) describes standard

procedures for processing and identifying the remains. Samples are sifted through nested geological screens to group materials of similar size together. The contents from each screen are examined systematically under the microscope, and any organic materials are removed. Plant materials may appear in the form of seeds, fruits and nuts, wood, roots and tubers, fibers, leaves, or non-woody stems; paleoethnobotanists need a good knowledge of plant anatomy, morphology and taxonomy, as well as an understanding of ecological associations and plant communities that are likely to appear at the site. A reference collection from the region is best for effective identification (Korber-Grohne 1991). When botanical remains are identified, their counts and often weights are recorded. The remains are labeled and archived for future reference.

### **UMARP Identification Procedures**

Floated samples from the UMARP excavations were sorted following the procedure described by Pearsall (2000). Identifications were made with reference to an Andean comparative plant collection.

### **TAPHONOMY**

Archaeological sites are not snapshots of life in the past, but rather they undergo both natural and cultural formation processes that must be understood in order to correctly interpret their remains (Schiffer 1983). It follows that plant remains found in archaeological contexts are rarely direct reflections of the human activities that took place there. Plants go through a variety of transformations during their use: they are harvested, processed, broken, dried, boiled, ground, woven, smoked, buried, burned, and discarded. Different types of plants have parts that preserve differently: pits, nut coats, wood, and starchy seeds are less likely to decompose than fleshy fruit, leaves, oily seeds or root crops. Sometimes the cultural use of a plant may prevent its deposition in the archaeological record—plants valued for their leafy greens, for instance, may not be allowed to go to seed. On the other hand, some plants are prolific seed producers and may appear with disproportionate representation.

Not all plant remains found at sites were intentionally brought there by humans. Some may have been carried by wind, tracked in by animals, or hitchhiked with other taxa or on clothing. Even if the presence of a plant is intentional, the remains are often deposited as trash or waste, away from the primary sites of their processing and use. Once deposited, natural processes such as decomposition and bioturbation over hundreds of years change the ways in which the plant remains appear in the archaeological record.

Preservation of botanical remains requires special conditions. The majority of archaeobotanical remains are carbonized or charred. This of course biases the record towards plants and activities that involve the use of fire. Remains in hot, arid climates or cave shelters may be desiccated; others may be frozen, water-logged, mineralized, or survive as imprints in other materials.

The importance of taphonomy in the interpretation of archaeobotanical remains has been addressed by many researchers. Miksicek (1987) presents a nuanced consideration of the transformation processes affecting archaeobotanical remains. He discusses different environments and assesses which materials preserve best under various conditions, and examines different ways plant parts may be preserved through carbonization. In addition to cultural and

environmental transformation processes, Miksicek also looks at the way analytical transformations of the data base, such as sampling, processing, and quantification, can influence the interpretation of the data.

Beck (1989) also looks at archaeobotanical taphonomy in terms of Schiffer's cultural and natural transformation processes. She examines the impact of environmental conditions and human activities on the rate and nature of plant decomposition. Both Miksicek and Beck turn to ethnoarchaeology as a good source of information about taphonomic processes: Miksicek presents a cautionary tale of a pack-rat's nest that could be mistaken for the remains of human activities, and Beck analyzes the breakage patterns of cycad seeds to differentiate the natural and cultural origins for plants in archaeological sites.

Pearsall (1988) assesses abundance (ubiquity and frequency) by looking at the source (plant use and deposition) and cultural context using a data set from Panaulauca Cave, Peru. She demonstrates how abundance patterns can have different meanings depending on the source and context of the plant remains. Although she emphasizes how many variables contribute to the patterns that are found archaeologically, her discussion helps clarify the type of archaeobotanical analysis that can be done.

Miller (1989) addresses the problem of correctly proveniencing plant remains that are not carbonized. She evaluates three uncharred assemblages from historical sites and finds that at least one is from modern intrusions, and another may have been introduced by rodent disturbances. Her analysis emphasizes the necessity of taking site formation processes into account when analyzing archaeobotanical remains. Elsewhere Miller argues that many carbonized seeds traditionally thought to represent food remains may have in fact been animal fodder and have entered the site in dung cakes burned for fuel (Miller 1984, 1996). This "dung hypothesis" has been refuted by Hillman et al. (1997) as it pertains to the Abu Hureyra site in Syria, but it serves as an important caution about the necessity of carefully considering the origin of botanical remains in archaeological contexts.

Finally, rather than using evidence of taphonomic processes to interpret botanical remains, Asch and Sidell (1988) explore how plant remains can contribute to stratigraphic interpretations at a site. They show that differential frequencies of archaeobotanical remains often correspond to different occupations, allowing archaeologists to establish stratigraphic profiles that were otherwise ambiguous.

### **UMARP Taphonomic Considerations**

Botanical remains recovered from UMARP excavations have gone through a series of cultural and natural transformations, which must be taken into account for their interpretation. Sikkink's (1988, 2001) ethnoarchaeological investigations of contemporary households in the Mantaro Valley help shed light on some of these transformations and can guide the interpretation of the prehistoric remains. Sikkink investigated the ways in which ethnobotanical data reflects behavior by analyzing soil samples from three traditional domestic structures in which she had observed activities and organization. She found that although charred remains represented only a fraction of the modern assemblages, and some taxa were not charred at all and so would be invisible archaeologically, crop taxa did have a higher chance of becoming charred, and cultural activity increased the likelihood of carbonization. Sikkink also found distinct patterning across

contexts on the floors of houses, reflecting differential use. Modern seed densities generally decreased from the central patios to peripheral rooms. Sikkink hypothesizes that this reflected the difference between multi-use and specialty use activity areas, demonstrating that seed density reflects the intensity of use. Kitchen samples showed an unusually high diversity of food-related remains, with crop samples present in much higher densities than in other areas. Sikkink also found significant variation among the three households, related to different activities, including plants grown and animals kept, as well as household membership structure and general housekeeping habits.

Hastorf and Wright (1998) addressed Miller's "dung hypothesis" by charring modern samples of animal dung from Peru, Bolivia, and Argentina and analyzing the seeds they contained to see if a "dung signature" could be identified. In the Mantaro Valley, camelid dung was collected from the high puna and guinea pig dung was collected from a household floor. None of the guinea pig dung samples contained any recognizable botanical remains, suggesting that the guinea pig dung burned for fuel was likely not a source of seeds in the archaeological record. They did find several seed types commonly occurring in camelid and goat dung in all three regions, however, including *Relbunium*, small and large grasses, wild legumes, *Chenopodium*, Malvaceae, Cyperaceae, and Cactaceae. Regional variability in the frequencies of these taxa generally reflected local ecological conditions and plant communities, although it was notable that *Relbunium* was disproportionately represented in camelid dung.

These investigations demonstrate that patterns of archaeobotanical deposition in domestic structures can indeed reflect behaviors that took place at the household level. They caution us to remember that botanical remains that preserve through charring represent only a skewed fraction of the household assemblage, but they are encouraging that food and other culturally related remains may be more likely to survive in the archaeological record, especially in areas such as kitchens that were centers of food preparation and consumption. Taphonomic considerations specific to particular taxa in this study are discussed below in Chapter 5.

## ARCHAEOBOTANICAL DATA ANALYSIS

Once botanical materials have been recovered from the site and sorted and identified in the laboratory, some form of data analysis is necessary for using the information to make inferences about human behavior. The archaeobotanical data set usually consists of counts and weights of taxa from each flotation sample. From this information, a taxa list of plants present in the archaeological record can be generated. Taxa lists can be very informative regarding evidence for domestication, trade of non-local taxa, ecological resource exploitation, vegetation history, ritual practices, and seasonality of site occupation, among other things. As discussed above, however, human activities and other site formation processes are likely to leave non-homogenous depositions of plant remains across space and time, and quantitative analysis is an excellent tool to explore and define these patterns. This study focuses on exploratory data analysis, in which statistical methods are used to reveal patterns in the data that suggest interpretations, rather than statistical hypothesis testing.

Pearsall (2000:192-224) presents an excellent review of methods of quantitative analysis in archaeobotany. She distinguishes between non-multivariate and multivariate statistical approaches, arguing that each has potential benefits when applied appropriately to the right data

set. This discussion will follow Pearsall's organization in describing different types of quantitative techniques, their potential utility, and examples of their applications.

### **Non-Multivariate Techniques**

Simple quantitative approaches can be quite a powerful way to elucidate patterns in archaeobotanical data. The raw number of each taxon present in each flotation sample is given as absolute counts, but these are subject to variation in sample size, depositional conditions, and preservation among samples. Weights of botanical materials are often recorded too, especially for heavier materials that do not appear in discrete units or fragment easily, such as wood and nutshells, but these are subject to the same issues as raw counts. Absolute counts and/or weights must be transformed in some way to make the numbers comparable among samples (Popper 1988).

*Ubiquity* analysis, or percentage presence of a given taxon, is one simple way to transform the raw data and make inferences about how common a taxon is through space and time (Popper 1988; Pearsall 2000). Ubiquities are calculated by scoring an individual taxon as either present or absent in each unit of analysis, and then dividing the number of units with the taxon present by the total number of units to get a frequency score (or percentage presence.) Units of analysis may be individual flotation samples, or composites of flotation samples such as features (e.g. Johannessen 1984). Ubiquity analysis allows for comparison among units of analysis that may differ widely in sample size, depositional conditions, and preservation because the presence of a taxon is given the same weight if it appears once or hundreds of times. It also allows individual taxa to be considered separately, with no impact from variation in the counts of other taxa, which can be a problem with ratio calculations (see below.) Ubiquity assumes that each unit of analysis is independent, although a large number of units in the data set can help to reduce the effect that inappropriately combining or splitting units will have on the frequency scores. Researchers have used ubiquity on a regional scale to trace trends in crop production and land use (Johannessen 1984; Hastorf 1983), at individual sites to examine changing use of different crop plants (Thompson 1996; Pearsall 1988), and on supraregional level combining data from many different studies to address the introduction of domesticates (Hubbard 1975).

*Ranking* is a way to add weight to the simple present/absent scores of ubiquity analysis while still reducing bias from sample size and depositional conditions (Popper 1988). Absolute counts are translated to an ordinal scale through a formula developed for each taxon, which takes into account its expected preservation and seed production. Ranking allows for comparison of abundance across contexts, but requires similar preservation conditions and high counts for the assumptions used in creating the ordinal scale to be valid.

*Densities* are a very useful way to compare taxon abundance across samples (Miller 1988; Pearsall 2000). Densities standardize for variation in sample size by dividing the absolute count of a taxon in a sample by the total volume of soil in the sample. Percentages are another type of ratio where the denominator is a total that includes the data in the numerator (Miller 1988); in this case the absolute count or weight for a taxon is divided by the total count or weight of all botanical material in the sample. Percentages standardize for sample richness, which may be a result of varying depositional patterns or preservation conditions. Both of these ratios provide relative measures of abundance that can have greater resolution than ranking, but they are more subject to the biases introduced by sample variability. Densities and percentages are

commonly used in archaeobotany. Among other things, researchers have used densities to examine fuel consumption (Asch and Asch 1975), intensity of occupation (Pearsall 1983), and seasonality (Wright, Miller, and Redding 1981), and percentages have been used to investigate changes in plant production and procurement over time (Scarry 1993), to trace crop production and consumption in multiple sites (Jones 1985), and to demonstrate spatial patterning related to domestic activities (Lennstrom and Hastorf 1992).

*Comparisons* are another type of ratio that are particularly good for understanding different contexts of use and preservation regimes (Miller 1988). The numerator and denominator in comparison ratios are not related, but are usually counts or weights of two different botanical items. Charcoal can be used as the denominator when comparison ratios are employed to control for likelihood of preservation because it can serve as a good proxy for intensity of occupation or burning activities. Comparison ratios have also been used to demonstrate how one type of food or fuel replaced another (Asch et al. 1972; Pearsall 1996) and to build crop-processing models (Hillman 1984).

Finally, *diversity* is another way to characterize archaeobotanical assemblages (Popper 1988). The specific methods for calculating diversity are beyond the scope of this paper, but measurements of diversity generally depend on the total number of taxa and their relative abundance. If a sample is composed of a large number of different taxa with a fairly even distribution, then the diversity index for that sample is high. Diversity can help highlight patterns in archaeobotanical assemblages, indicating for example areas of specialized activities, but it can only show general trends as samples with very different compositions can be assigned the same diversity index.

All of these fairly simple quantitative techniques can be quite powerful tools for analyzing archaeobotanical data, but it is important to be aware of their limitations. Kadane (1988) examines several of these techniques from the point of view of a statistician and voices some concerns. He argues that ubiquity gives an over simplification of the data while still being subject to the effects of preservation and sampling, and that likewise when using ratios it is necessary to explicitly discuss preservation effects. Hubbard and Clapham (1992) promote the use of ubiquity measures for most types of samples, but caution against what they view as unwarranted interpretations. They outline a classification system for samples based on how well their origins and depositional processes are known. In their view, remains from secondary, mixed deposits, which make up the majority of the botanical assemblage, are useful only for compiling taxa lists of plants present at a site, and ubiquity is sufficient for that. Jones (1991) takes a different approach, distinguishing between descriptive quantification and assessing the importance of a taxon. She argues that many studies using simple quantification techniques assume that the abundance of a plant reflects its importance, without considering whether the plant was selected for use or represents discarded refuse. Jones promotes the use of multivariate techniques, after transforming and standardizing the data, in a problem-oriented approach aimed at revealing patterns in assemblage.

## **Multivariate Techniques**

As Jones points out, statistical approaches that analyze more than one variable at a time can also be used in exploratory data analysis. For the data to support multivariate analysis, the variables used must be recorded and scored in a consistent manner. Systematic sampling

procedures and consistent recording of archaeological context information help make an archaeobotanical data set appropriate for multivariate analysis. There are many different types of multivariate techniques, and the following discussion will highlight several that have been used in paleoethnobotanical studies. The mathematics of each multivariate technique are beyond the scope of this study, but instead the discussion will focus on the application of each method.

*Cluster analysis* is a way of sorting many units of analysis into distinct groups based on degree of similarity across multiple variables. Jones (1987) uses cluster analysis to identify crop processing in the archaeological record. Her aim is to distinguish the effects of crop processing from other sources of variability in the archaeobotanical assemblage in order to address other questions. While she and other researchers have used ethnographic analogies to build crop processing models (Jones 1984; Hillman 1984; Reddy 1984), Jones demonstrates that an internal analysis using only the archaeological data can also be effective. In her example from Greece, the carbonized samples fall into two main clusters, one with characteristics of by-products or refuse most likely burnt as fuel, and the other accidentally burnt final products. Two studies using cluster analysis with botanical data from coprolites, however, serve to caution against over application of the method. Sutton and Reinhard (1995) examine botanical remains from coprolites to investigate Anasazi diet and cuisine. They identify three primary clusters: coprolites containing whole kernel maize, those containing milled maize, and those with no maize at all. Although they interpret their results as reflecting seasonal and preference-related cuisines, an attempt to reproduce their analysis from the raw data they present demonstrates that the trends they identify are not particularly compelling and do not necessarily support their interpretations. Sobolik and Gerick (1992) likewise use cluster analysis on coprolite data to examine the use of certain plant taxa (*Ephedra* and *Prosopis*) as medicinal herbs. They divide the coprolites into three groups based on consistency, from solid to soft and runny, and work from the assumption that runny coprolites indicate stomach problems that may have been treated with these medicinal taxa. They find a correspondence between pollen grains from these taxa and the runny coprolites, and conclude that *Ephedra* and possibly also *Prosopis* were used to counteract diarrhea. Although their approach is intriguing and clever, they are limited by the small size of their data set, and like Sutton and Reinhard the results of their analysis unfortunately do not support their conclusions as strongly as they claim. A more successful application of cluster analysis can be seen with Scarry's (1993b) evaluation of the agricultural risk model for the emergence of hierarchical social organization in the Moundville chiefdom. Scarry's strategy is to project what may be evidence if it were indeed the case that agricultural risk caused the emergence of social hierarchy. She posits that one would see subsistence change occurring before change in social organization, as well as signs of environmentally risky conditions and evidence of other strategies for buffering against risk. Scarry uses a cluster analysis of corn features to demonstrate convincingly that more than one type was cultivated, which could have served as a buffer against risk. She also finds that communities did alter their subsistence strategies before the change in social organization took place, but her evaluation of environmental conditions shows that a major crop failure was very unlikely.

While cluster analysis can be used to create distinct groupings in the data, *discriminant analysis* can be applied to discover what characteristics best distinguish pre-defined groups. This information can then be used to categorize ungrouped units of analysis. For example, Jones (1984) uses discriminant analysis to develop a crop processing model from ethnographic analogy. She analyses the by-products of four different stages of ethnographic crop processing, and identifies three functions that together best distinguish among them (seed size, headedness,

and lightness.) By characterizing unclassified samples according to these three functions, it should be possible to determine which crop-processing stage they represent. Jones argues that since the discriminating characteristics have to do with physical properties of the seeds, the results can be directly applied to archaeological samples, regardless of whether the crop species used were different. Discriminant analysis can be useful in characterizing the differences among other important pre-defined groups besides the by-products of ethnographic crop processing stages: for example, it can help distinguish between different races of maize or species of wheat (Kosina 1984), or between wild and cultivated varieties (Mangafa and Kotsakis 1996).

*Factor analysis* also seeks components or factors that best explain variability in the data, but it differs from discriminant analysis in two important ways. First, similar to cluster analysis, rather than being applied to pre-defined groups, it is an internal method of classifying the data. Second, rather than identifying the most important measured characteristics, it seeks underlying factors that are derived from measured variables. While groupings in the data can be inferred from the results of factor analysis, the method differs from cluster analysis, which categorizes every unit of analysis into a cluster or group. *Principal components analysis (PCA)* is a type of factor analysis that has been applied in archaeobotanical research. Factor analysis and PCA have been used successfully to identify positive and negative correlations between many different taxa from multiple samples (Hastorf 1983; Marquardt 1974). Hillman (1984) presents a very thorough study of how to interpret crop processing from archaeobotanical remains using PCA. He builds a model for the stages of crop processing and the botanical products at each stage based on ethnographic studies, and then demonstrates how the model may be applied to archaeobotanical remains. He recommends using principle components analysis if the number of samples is high, presenting a thoughtful discussion of the method and its possible interpretations.

### Correspondence Analysis

Another type of factor analysis with great potential for archaeobotanical research is *correspondence analysis (CA)*. While PCA analyzes the interrelationship between variables like the aforementioned multivariate techniques, correspondence analysis is simultaneously concerned with the interrelationship between units of analysis (Greenacre 1984; Madsen 1988). It is particularly useful for detecting patterns in archaeobotanical data sets because it is well suited to archaeological context variables, makes no assumptions about their distributions, and does not require any prior model or expectations (Madsen 1988, p. 14). Since this study uses correspondence analysis as its principle statistical method, the technique will be explained here in more detail below.

Correspondence analysis was first developed in France in the 1960s by Jean-Paul Benzécri as a technique for linguistic analysis (Benzécri 1969.) Although the method found popularity in Europe for a wide range of applications, it was slow to gain acceptance in the English-speaking world due to differences in statistical philosophy, culture and presentation (Greenacre 1984, p. 10). Publications by Hill (1974) and Greenacre (1984) helped bring the technique to the attention of Anglo statisticians and explain its methodology and applications to English-speaking researchers. Correspondence analysis and variations of the technique have been most notably adopted by community ecologists looking for patterns related to species and environments (e.g. Ter Braak 1987; Palmer 1993; McCune 1997). Bølviken et al. (1982) helped introduce the method to the archaeological community. Later publications discussing the general

application of correspondence analysis to archaeological data include Madsen (1988) and Ringrose (1992). Among other things, correspondence analysis has been applied to questions of seriation of ceramics and other materials (Bech 1988; Højlund 1988; Nielsen 1988; Duff 1996), settlement patterns (Holm-Oslen 1981, 1988; Engelstad 1988), taphonomy (Bertelsen 1988), and environmental resource use (Denys 1985; Avery and Underhill 1986).

Correspondence analysis has been an especially useful tool for paleoethnobotanical investigations. Powers et al. (1989) apply the method to late prehistoric and modern phytolith assemblages in northwest Britain to examine human impact on the landscape. They find that anthropogenic deposits are recognizable by certain suites of phytolith types and overall higher concentrations. Ishida et al. (2003) use correspondence analysis to examine phytolith types by phase at a site in the United Arab Emirates. They find that distinct assemblages characterize different phases at the site, and that the lack of a certain class of phytoliths indicates that intensive irrigation in the area was unlikely. Kerig and Lechterbeck (2004) apply correspondence analysis to palynological data to reconstruct settlement history and the evolution of the landscape in southwest Germany. They conclude that the role of human impact is the single most important factor in the vegetational change in the landscape they are studying. Charles et al. (1997) demonstrate the application of “FIBS” (Functional Interpretation of Botanical Surveys), a technique developed by plant ecologists that incorporates correspondence analysis, to questions of prehistoric agriculture and crop husbandry, using samples from modern Spanish fields to develop signatures for dry-farmed versus irrigated land. Colledge (1998) also uses correspondence analysis to address questions of cultivation and land use, focusing on the transition to agriculture. Looking at published data from five sites in Syria, she identifies vegetational fingerprints that may indicate the cultivation of wild taxa prior to their full domestication. Bouby and Marnival (2004) examine macroremain assemblages from Roman-period grave offerings in Limagne, France using correspondence analysis to look for regional variation in funerary practices and economy. Correspondence analysis has also been applied to taphonomic questions in archaeobotany. Van der Veen (2007) examines formation processes evident in macroremains, arguing that the routine practices that form the archaeobotanical assemblages reflect the social and cultural behaviors that structure them. On the other hand, Hosch and Zibulski (2003) find a great deal of the variation in their macroremain assemblages can be ascribed to inconsistent recovery technique, as correspondence analysis appears to group the samples according to wet-sieving effects.

To illustrate how CA works, Table 4.1 gives values for a set of mock flotation samples taken from three different time periods (Early, Middle, and Late) at a site containing five different taxa of interest (Apples, Bananas, Carrots, Dates, and Eggs). The units of analysis are the five different taxa and the variables are the three different time periods. Correspondence analysis can be applied to describe any patterning among the taxa with regard to time period. First, the data are summed to give the total count for each taxon per time period. Then a two-way contingency table is constructed showing the count and frequency of each taxon by time period (Table 4.2). Each cell in the table gives four different values that illustrate the relationship of a particular subset to the whole. For instance, the first data cell in the table in Table 4.3 says that there are 286 apple remains recovered from the Early period (Count). This represents 8.36% of the total number of items found in the entire data set (Total %, or frequency). This Early material also represents 41.79% of the apple remains from all three time periods (Col %, or column profile). Looking at it another way, apples represent 20% of all remains from the Early period (Row %, or row profile). These values are summed as marginal

totals and frequencies in the bottom row and far right column; for instance, there are 685 apple remains recovered, representing 20% of material collected, and there are 1431 items from the Early period, representing 41.79% of collected material. The grand total is recorded in the bottom right cell as 3425 total items recovered.

The associations between row and column profiles of this two-way contingency table can be visualized statistically through correspondence analysis, a geometric technique for representing multi-dimensional relationships among the points in two or three dimensional space (Greenacre 1984). The results of the analysis on this table are displayed in a plot in Figure 4.1. Both units (Taxa) and variables (Time periods) are plotted as points, and their associations with each other are represented by their relative proximity. The plot shows that bananas are associated with the Early period, carrots with the Middle period, and both dates and eggs with the Late period. Apples are situated exactly at the origin of the axes, as they represents 20% of the material recovered in each phase and so have no particular association with any time period. These results could support the interpretation that the Early period occupants of the site were keen on bananas, but as time passed the fruit fell out of favor and by the Middle period carrots were all the rage. The Late period saw a shift in taste to more exotic dates as well as eggs. The association of dates and eggs on the plot may be indicative of a Late period trend towards date omelets, or it may simply of a result of the diet diversifying during the Late period. In other words, the relationship among units on the plot can only be interpreted with reference to the variables, and vice versa. Finally, it appears that despite all of these changes, apples remained a constant part of the diet over time, possibly due either to their perceived importance, or conversely because they were so common their consumption was unaffected by changes in cuisine.

## **UMARP Data Analysis**

This study focuses on the analysis and interpretation of paleoethnobotanical data recovered during the second phase of UMARP investigations, 1982-1983. All of the UMARP raw data were originally recorded on data entry cards and entered into an IBM mainframe computer at the University of Minnesota and stored on six 9-track tapes (HAST 1-6). The information on five of the tapes (HAST 2-5) were later converted to digital media and stored on compact discs as simple text files, but one tape (HAST 1) was not able to be converted due most likely to corrupted or damaged files.

The first step in this study was to create an index of the text files from the tapes and characterize them as data, documents, or program files. I identified data files for the UMARP analytic units (provenience data), as wells as for artifacts such as botanical remains, ceramics, lithics, bone, metal, and shell. Artifact data files included general catalogs for each of the material classes, as well as raw data from more detailed analysis of specific subsets. Many data sets were divided into multiple text files. Other files from the tapes included documentation about the data sets, including descriptions of data files and codes for data sets, which proved useful for correctly identifying the data. The majority of the files on the tapes were the text of SAS programs written to analyze the data or the output of analytic procedures.

The next step was to make the data in the text files accessible for quantitative analysis. I imported data sets for the UMARP Phase II analytic units (provenience data), as well as general catalog botanical remains, ceramics, lithics, and bone into Microsoft Excel. Then I concatenated

the multiple files for each data set into a single spreadsheet. Using the original data entry cards or code lists as templates, I wrote formulas in the Excel spreadsheets to place each of the digits of raw data into its correct column and translate the entries into meaningful numbers or text. These Excel files containing the original text and translated data were archived in the Paleoethnobotany Laboratory at the University of California, Berkeley.

I filled in incomplete information from the original botanical and UMAPR analytical unit data sets using the original flotation log and excavation notes. When a discrepancy was noted between the excavation notes and the UMAPR analytic unit data set, the information in the latter was retained, as it was thought to reflect revisions made to the provenience assignments following excavations, some of which were documented with the excavation notes.

I then imported the “cleaned up” data from these five data sets (analytic units, botanical remains, ceramics, lithics, and bone) into Microsoft Access and linked them in a relational database, which was also archived in the UC Berkeley Paleoethnobotany Laboratory. I performed statistical analysis using JMP 8.0.1, using exploratory data analysis to look for patterns in food-related remains within patio groups at all four sites. Statistical techniques were chosen and the analysis designed in consultation with the Statistical Consulting Service of the Department of Statistics at the University of California, Berkeley. Correspondence analysis was the principle technique employed to seek trends in the data relating artifact categories (units) to provenience information (variables.) Regression and graphical data displays were used to focus on some specific patterns that were suggested by the correspondence analysis. Preliminary statistical analysis was performed on the ceramic, lithic and bone data sets, but the results were inconclusive, most likely due to problems with the way the different artifact types were classified and the measurements that were chosen for analysis. The results of the statistical analysis of the botanical data form the basis of this study.

## **PALEOETHNOBOTANICAL INTERPRETATION**

Exploratory data analysis is an iterative process: the results of the analysis suggest interpretations of the data, which in turn may lead to new approaches to the analysis. In general, paleoethnobotany can be used to address many questions basic to the study of archaeology and anthropology. By examining people’s interrelationships with plants in the past, we can gain a valuable perspective on traditional archaeological issues and even pose new questions. This section reviews selected contributions of paleoethnobotany to four important areas of archaeological inquiry: the origins of agriculture, ecological stability and change, subsistence strategies, and socio-political development.

### **Origins of Agriculture and Crop Domestication**

How did people begin farming domesticated crops? When and where did the transition to agriculture take place? These questions can be addressed through a paleoethnobotanical approach. Interpretations of plant remains in the archaeological record can help elucidate the many ways in which human societies are influenced by the plants they encourage, manage, or control.

Sauer (1969) presents a model of plant and animal domestication based on deductive reasoning stemming from six basic premises. He argues that the right environmental conditions

would have included a favorable climate, resource diversity, and wooded lands that were easy to clear, and that socially the domesticators were likely already sedentary, predisposed to agriculture experiments, and not experiencing food shortages. On the basis of these predictions he proposes that southeast Asia is the most likely area for the “hearth of domestication.”

Hayden (1992) likewise argues that early domestication took place not in response to scarcity, but in conditions of surplus. He suggests that rather than being staples of the diet, the first domesticates were prestige foods that were used by the more powerful members of socially stratified societies to gain prestige and consolidate their position through competitive feasting.

Other researchers take a different approach from Sauer’s deductive reasoning, and argue that there is not a single universal explanation for the origins of agriculture. Blake et al. (1992) point out that there may be a difference between the mechanisms for the origins of domestication and its spread, and that the environmental and social conditions leading to either in different regions may vary, so the issue must be examined on a case-by-case basis. They analyze plant remains, fish and animal bones, and stable isotope data from the Soconusco region of Mexico during the Early and Middle Formative and find that there was in fact a decline in maize consumption after it became cultivated. They conclude that in this trend in the Soconusco region supports Hayden’s model for the spread of agriculture in regions with plentiful resources.

Piperno and Pearsall (1998) take a slightly different approach to the question of resource scarcity versus plenty and its influence on domestication. Focusing on the origins of New World agriculture, they postulate that the tropical forest was the most likely place of early domestication, because its environment was just challenging enough to spur experimentation without being so difficult as to make the stakes too high for risk.

The domestication of plants may also be intimately linked to animal husbandry. Pearsall (1989) proposes a co-domestication model for the Andes. She argues that camelids disturbed and fertilized the soil in their enclosures, creating hospitable conditions for certain plants which were encouraged and cultivated. In support of this theory, she examines charred plant remains from the Panaulauca Cave and finds an overall trend for increasing size in *Chenopodium* seeds and *Lepidium* corms, indicating their domestication.

In addition to macroremains and stable isotope analysis, phytoliths may provide important information regarding crop domestication. Pearsall and Piperno (1990) examine phytoliths to trace the spread of maize domestication in South America. They argue that phytoliths can be used to distinguish between maize and its wild grass relations, and present data from sites in Ecuador that support the early introduction of domesticated maize into South America.

## **Environmental Stability and Change**

The natural environment has changed over time, and humans have both reacted to and influenced those changes. Paleoethnobotany be used to help track environmental change and provide valuable insight into the interrelationship between human societies and their surroundings.

Palynology, or the study of pollen remains, can be an effective tool for tracing long-term environmental change. Day (1993), for example, examines pollen and charcoal from cores taken at the Star Carr site in Yorkshire. While she takes the pollen record to indicate environmental

change, she uses the charcoal signature as an indicator of human activity. She concludes that environmental change in the early Mesolithic is best explained as the result of human activities. Rich and Newson (1995) likewise use pollen and macroremains to examine the paleoecology of a site in Florida. From the data they are able to characterize the site as a mesic-xeric woodland very near the shore in shallow marine water, and conclude that the ecology of the site was generally stable over the past million years.

One approach to understanding environmental stability and change in the context of human behavior that fits well with archaeobotanical methods is historical ecology. While paleoethnobotany examines the interactions of people and plants in the past, historical ecology is the study of human interaction with the environment over time (Balée 1998; Crumley 1994; Kirch and Hunt 1997; Lentz 2000; McIntosh et al. 2000). According to this approach, the natural world presents a set of conditions that shape and organize human life, while the actions of people constantly modify and transform the environment around them. Kidder (1998) argues that Native Americans in Louisiana actively altered their environments by changing the floristic composition of habitats on shell mounds. He demonstrates how the vegetation on shell mounds is still different and more diverse today than that of surrounding areas, most likely due to their elevation and calcium-enriched soils. Allen (1997) examines evidence for human-environmental interplay in four areas of windward O'ahu Island, Hawaii. While climate and geography did play a role, she argues that the key to landscape change was human impact. Population pressure forced vegetation clearing and cultivation of slopes, which led to erosion of hillslopes and the filling of bays and lagoons and eventually agricultural land. She finds evidence for terracing in the archaeological record, which is also a successful solution to hillside cultivation in the region today.

Golson (1997) also looks at the effects on human-induced environmental degradation on changing cultivation practices. In highland New Guinea he argues that climate change spurred early horticulture to move to higher elevations, initiating a process of forest clearance which led to soil degradation. Sweet potatoes were uniquely suited to these poorer soils, and their cultivation supported pig husbandry, which in turn spurred more established agricultural practices. Schmidt (1994) links historical ecology in the Westlake region of Tanzania with the current public health crisis. Using pollen and charcoal records, he traces landscape change over the past 2500 years, demonstrating how apparent deforestation and erosion made fuel for iron ore smelting scarce. He argues that the modern dissolution of the communities' social and religious systems has destroyed the system of regulation for scarce resources, and overstress on the land has led to large population movements that have allowed a devastating spread of AIDS and other sexually transmitted diseases.

## **Subsistence Strategies**

Paleoethnobotany can also help characterize the subsistence strategies of different archaeological cultures. Plant remains have been used to reconstruct what people were eating, stability and change in diets over time, how food was procured, and how subsistence was related to social, political and economic development.

Reconstructing subsistence from archaeobotanical data is a central concern for some studies. Pearsall (1996) uses macrobotanical remains and phytoliths from Lowland Ecuador sites to characterize the diet and assess the importance of maize. She provides a good discussion of

possible taphonomic bias and how to control for it using wood ratios, and demonstrates how the macrobotanical and phytolith data sets can work to complement each other. She concludes that the importance of maize in dietary subsistence may have been later in time than it was originally thought to be.

Stability and change in subsistence strategies over time is another focus for many studies. Newsom (1994) analyzes macrobotanical and pollen samples from a midden site in Florida with exceptional preservation and a wide range of taxa. She finds that the lake and surrounding area provided a stable subsistence base, leading to conditions that were ideal for sedentary populations, with similar species recovered from archaeological contexts as those seen today. Pearsall (1983) compares archaeobotanical data from two sites in coastal Ecuador and one in Peru to determine the stability of subsistence strategies. She finds that charred wood may be correlated with intensity of occupation at all of the sites. She concludes that the occupants of the Peruvian site appear to have employed a long-term, stable strategy during the first four occupational phases, with change evident after that. Fritz (1993) reviews the use of plants in the Early and Middle Woodland period in the Eastern Woodlands of North America. She addresses traditional biases towards hunter-gatherers that have overshadowed the growing significance of horticulture in this region, and finds that these periods see a continuation and acceleration of trends in subsistence strategies that had begun in the Archaic.

Other studies are concerned more specifically with modes of production and procurement for plant-based foods. The introduction to her edited volume, Scarry (1993a) makes a distinction among different modes of production, presenting working definitions for terms such as agriculture, horticulture, farming, gardening, and cultivation. Rather than a simple dichotomy between domesticated and wild taxa, she maintains that there is a spectrum of human involvement with plant growth and procurement. In the same volume, Yarnell (1993) gives an overview of plant husbandry in the Late Archaic period of the Eastern Woodlands. He proposes that plant domestication occurred in this region independent of Mexico and that native plant crops were more important to subsistence than previously recognized, because they were displaced later by Mexican crops.

In her review of paleoethnobotanical research in western South America, Pearsall (1978) identifies three basic systems of production and procurement based on geography and elevation. In the high altitude puna, she sees a stable long term pattern of localized gathering, regional self-sufficiency, a gradual transition to herding, and later agricultural development because of rich wild plant resources. In the mid-altitude inter-Andean valley there is seasonal use of wild resources from different zones and the spread of cultivated plants with social and economic contacts. In the coastal zones limited gathering of land-based resources leads to a shift to marine resource use.

As seen in some of the studies above, subsistence strategies can also be related to social, political and economic development. Food production, procurement, and use can be integral to the development of complex societies and social stratification. Scarry and Steponaitis (1997) analyze changing patterns of procurement and production over time at Moundville, as well as the different subsistence-related activities that took place in farmsteads and centers. They find that agriculture intensifies over time, as evidence by an increase in maize and decrease in nuts, and that production and early processing took place in farmstead settlements, after which the materials were transported to larger centers. Johannessen (1993a) reviews patterns of plant use during the Late Woodland period of the Eastern Woodlands. Big changes in social integration

took place during that phase, and although basic subsistence appears to have been stable, with significant regional diversity, there do appear to have been changes in the storage, distribution and serving of food.

### **Socio-Political Development**

Just as changing subsistence strategies can be key to the emergence of complex societies, food can be an essential element in negotiations of power and status. Paleoethnobotany therefore can contribute an important perspective to the study of socio-political change.

Social status can be established by maintaining differences in diet. Welch and Scarry (1995) use multiple lines of evidence, including macroremains and ceramics, to examine foodways in four areas of different social status in the Moundville chiefdom. Although consumption appeared to have been similar at all the places, they found that more processing occurred at the lower-status sites, with a higher proportion of serving ware with increasing status. Gumerman (1994) makes the valuable point that it is important to investigate differences in diet among different groups. He compares diets of specialists in three societies, arguing that groups with different levels of specialization may have obtained their food in different ways.

Status and power can be negotiated through the performance of food: the ways in which food is prepared, presented, and consumed can play a critical role in establishing social position. Blitz (1993) analyzes ceramics from various contexts as material evidence for food storage and feasting activities in a Mississippian community. Johannessen (1993b) expands on this theme, following changing foodways in the central Mississippi River Valley. She uses macroremains, ceramic assemblages and settlement patterns to evaluate change in food production, storage, distribution, preparation, and presentation. Although maize production increases, generally what is produced stays fairly constant, while more elaborate ceramic assemblages suggest that cooking and preparation became more complex as settlement patterns reflect a shift in political focus to more centralized locations.

Other studies have questioned traditional assumptions about the role of food production in social and political change. As discussed above, Scarry (1993b) uses paleoethnobotanical data to evaluate the agriculture risk model for the emergence of social hierarchy in the Moundville chiefdom, concluding that the change in socio-political organization was likely spurred by something other than agricultural risk. Similarly, Wymer (1993) shows that cultural changes in the Late Woodland period Ohio Valley were not necessarily correlated with changes in subsistence strategies.

Several previous studies using archaeobotanical data from UMARP investigations also address questions of socio-political change in the Xauxa region before and after the Inka conquest. D'Altroy and Hastorf (1984) investigate the contents of Inka state storehouses, or *qollqa*, in the Xauxa region. They analyze the structures' placement on the landscape in relation to Xauxa settlements, the spatial organization of the contents, documentary evidence, and macrobotanical remains to reconstruct a partial picture of centralized state-sponsored storage systems imposed on the Xauxa. Hastorf (1990) examines macroremains and stable isotope data from Xauxa sites over time to see the nature of the Inka's influence on the domestic economy. She finds that an increase in maize production during Wanka III indicates Inka involvement in local agricultural production beyond simple tribute demands. Botanical data from floor contexts

as well as stable isotope data indicate that the Inka state also affected consumption: the diets of both elites and commoners appear to have increased amounts of meat and maize. Hastorf and Johannessen (1993) expand on this thesis by focusing on the changing use of maize over time in the Xauxa region. They use multiple data sets (ubiquity and varieties of archaeological maize remains, ceramics, ground stone tools, and stable isotopes) to reconstruct a picture of how maize was prepared and consumed from Wanka I through Wanka III. In addition to confirming the previous findings, they identify a shift in maize processing during Wanka II from boiling to grinding, indicating the preparation of maize beer, or *chicha*, an important element of Andean feasts. They conclude that the elites of Wanka II may have used *chicha* and feasting to consolidate their power and build political alliances, and that in Wanka III the Inka likewise may have legitimized their power within that cultural context.

## SUMMARY

This study employs paleoethnobotany both as a method and an interpretative approach, using the systematic analysis of macrobotanical remains recovered from archaeological sites to shed light on the interactions between people and plants in the past. As discussed in this chapter, several issues are essential for building an informative data set of macroremains. Systematic collection involves designing a sampling strategy that makes sense for the site and for the questions that will be addressed. Flotation allows for the unbiased recovery of organic materials from soil samples. In the laboratory, plant remains are identified to the most specific level possible ideally using a reference collection from the geographical region. Taphonomic issues must be taken into account, such as what human activities or other events caused the plant remains to be deposited, and what transformational processes have acted on them until now. The UMARP botanical materials were collected through systematic sampling of every excavated context, processed with a SMAP-type flotation machine, and identified with reference to an Andean comparative collection. Ethnoarchaeology conducted in modern Andean households helped clarify taphonomic considerations.

Once botanical remains have been collected, processed, identified, and counted, the data can be analyzed. Several univariate methods provide powerful ways in which to interpret the data, and certain multivariate techniques may also be applied if the data can support them. This study focuses on the analysis of previously collected archaeobotanical data. It primarily uses correspondence analysis, a multivariate technique, to find patterns in the data that suggest hypotheses about how the Xauxa interacted with plants at the household level.

Paleoethnobotany is an approach that is particularly well suited for addressing many question of general archaeological and anthropological interest, such as the origins of agriculture, ecological stability and change, subsistence strategies, and socio-political development. This study builds on previous UMARP research focused on questions of political economy. By examining plant remains from individual domestic contexts, it seeks to build a picture of variations in Xauxa foodways that reflect changes in the social and political structure of the community as power shifts from local elites to Inka administrators.

## CHAPTER 4: TABLES

**Table 4.1** – Hypothetical Flotation Data

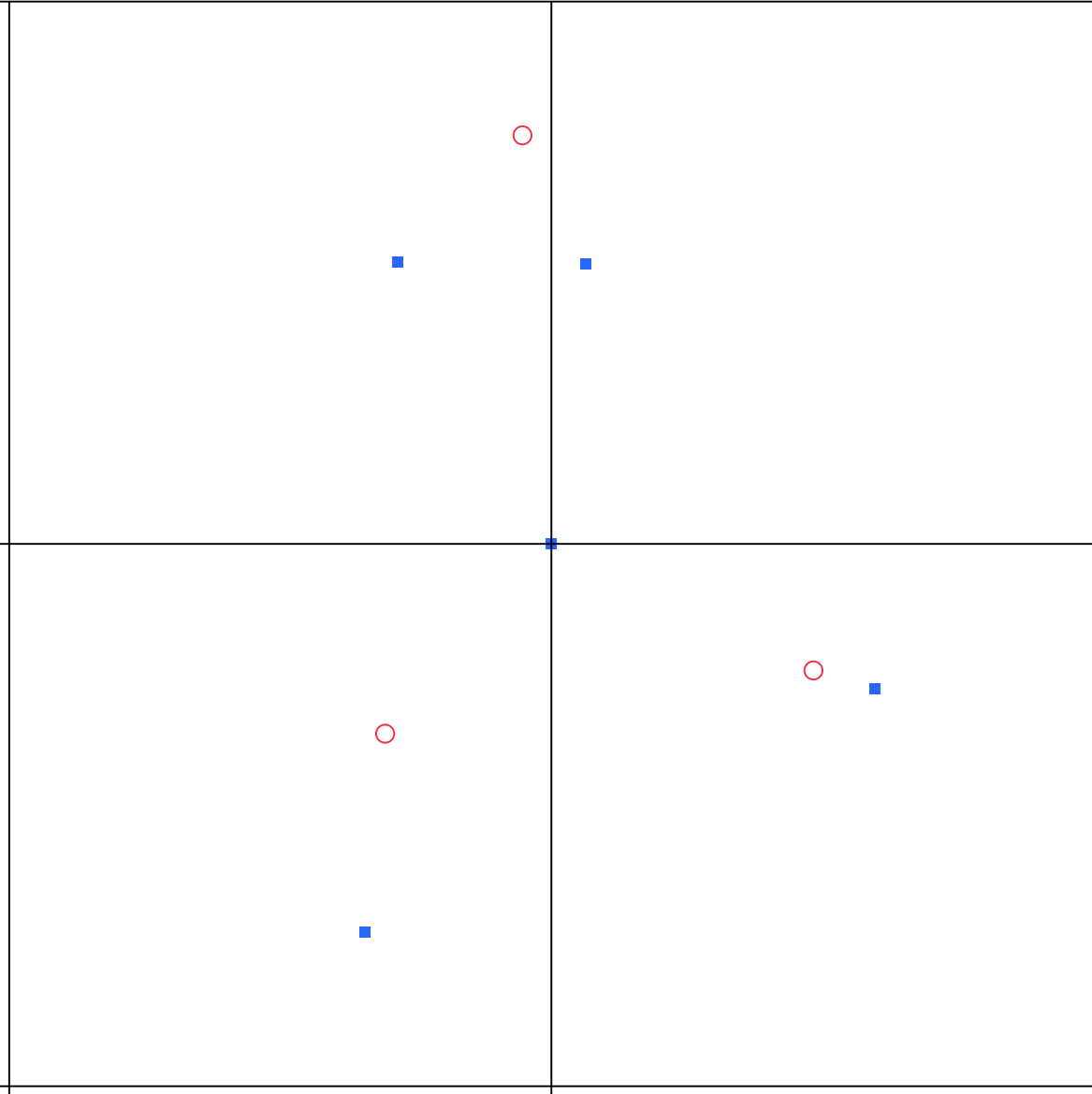
Flot #	Time Period	Apples	Bananas	Carrots	Dates	Eggs
1	Early	10	20	0	15	6
2	Late	65	30	60	90	80
3	Early	27	55	20	30	4
4	Early	15	20	10	10	20
5	Early	71	87	55	48	92
6	Middle	26	30	45	20	8
7	Early	31	60	30	10	25
8	Middle	16	15	30	12	8
9	Middle	44	67	70	12	28
10	Late	13	8	10	20	15
11	Late	47	23	30	70	65
12	Middle	69	54	90	88	45
13	Middle	48	34	60	56	42
14	Early	16	25	15	2	20
15	Early	5	10	5	0	4
16	Early	50	56	37	62	45
17	Late	41	23	30	50	60
18	Early	50	80	45	40	35
19	Early	12	20	10	8	9
20	Late	29	12	10	45	50

**Table 4.2** – Contingency Table for Hypothetical Data Set: Taxon By Time Period

Count Total % Col % Row %	Apples	Bananas	Carrots	Dates	Eggs	
<b>Early</b>	286 8.36 41.79 20.00	433 12.64 59.40 30.25	227 6.63 34.29 15.86	225 6.57 32.70 15.72	260 7.59 39.33 18.17	1431 41.79
<b>Middle</b>	204 5.94 29.71 20.00	200 5.84 27.43 19.66	295 8.61 44.56 28.99	188 5.49 27.33 18.48	131 3.82 19.82 12.87	1018 29.71
<b>Late</b>	195 5.70 28.50 20.00	96 2.80 13.17 9.83	140 4.09 21.15 14.34	275 8.03 39.97 28.17	270 7.88 40.85 27.66	976 28.50
	685 20.00	729 21.28	662 19.33	688 20.09	661 19.30	3425

**CHAPTER 4: FIGURES**

**Figure 4.1** – Correspondence Analysis of Hypothetical Data: Taxon by Time Period



## CHAPTER 5

### ANALYSIS OF THE PALEOETHNOBOTANICAL DATA

#### **Introduction**

This study uses archaeobotanical data to investigate the ways in which Xauxa foodways, evident at the household level, both changed and remained consistent over space and time. This chapter presents the results of the paleoethnobotanical analysis, using exploratory data analysis to identify patterns in the deposition of botanical remains, and discusses their implications. The chapter begins with a description of the types of botanical items that were recovered in the UMARP investigations, summarizing their documented ethnobotanical uses, and explaining the ways in which these items were categorized for the purposes of analysis. The second section explains the rationale behind the variables chosen and the series of steps taken to prepare the raw data for analysis. The next two sections present a regional-level analysis of both the flotation and screen data sets, examining the ways in which the different sites and time periods both resembled each other and differed in their botanical remains. The following section then takes a closer look at the patterns present at each site, sharpening the picture of the processes occurring at each site and emphasizing the variability present in the region. The final section walks the reader through a single compound with a spatial analysis of the botanical remains recovered from occupational surfaces, in an attempt to link these deposits to the daily activities of the Xauxa who lived in and used these spaces.

#### **THE BOTANICAL REMAINS RECOVERED**

Botanical remains recovered from the flotation samples as well as the ¼ inch screens were sorted and identified in Christine Hastorf's paleoethnobotanical laboratory at the University of Minnesota overseen by Heidi Lennstrom between 1983 and 1987. Seventy-six different types of items were identified to varying levels of specificity. Some items could be identified to species, others to genus, and others only to family. Some items were furthered classified beyond species to a particular plant part (such as *Zea mays* kernel and *Zea mays* cupule or cob.) Other items could not be identified to any level of botanical taxon but instead were classified by general form, such as tubers and parenchyma. Non-botanical items found in the soil flotation samples, such as lithics, shell, and animal dung, were also identified and, when applicable, combined with the appropriate data sets. Since animal dung provides evidence pertaining to cooking practices and fuel use, as well as possibly clarifying the taphonomy of wild seeds (see discussion below), it is considered in this study along with the botanical remains.

The majority of the different types of items identified appeared very rarely, and so for this study they were combined into 20 different categories, each of which were further classified as food or non-food related (Table 5.1.) The following discussion presents each of the different

categories, the item types included in each category, and a brief description of their ethnobotanical uses.

### **Food-related Categories**

A category was classified as food-related if ethnohistoric or archaeological evidence indicates that it was likely that the Xauxa used the botanical items in that category primarily for consumption. Food-related items include the four major Andean crops grown in the region: maize, tubers, *quinoa*, and legumes. Other food-related plants may have been cultivated on a small scale, tended as weeds, or gathered wild.

#### Maize

As discussed in Chapter 2, the valley bottom land of the Upper Mantaro River Valley a particular fertile area for the production of *Zea mays*, a key Andean crop. There is an extensive body of literature on the origins of maize cultivation in the Andes (Towle 1952; Bird 1979; Pearsall and Piperno 1990; Piperno and Pearsall 1993, 1998), its importance over time in various polities (Moore 1989; Hastorf and Johannessen 1993; Johannessen and Hastorf 1994), and particularly its integral role in Inka society and politics (Rowe 1946; Murra 1960, 1980; Morris 1979; D'Altroy and Earle 1985). A detailed summary of Andean maize research is beyond the scope of this study, but a few salient points about maize production and preparation can be made. First, previous research on the UMARP data has demonstrated that the overall production of maize increased under Inka rule (Hastorf 1983, 1990, 2001). Settlements were located closer to productive valley bottom land, and more maize was found in all types of domestic compounds (Hastorf 1990). Secondly, maize can be prepared and consumed in a variety of ways. Commonly the kernels are toasted, or they are boiled them for soups or gruels. A much more labor-intensive preparation process involves fermenting maize to make *chicha*, as described in more detail in Chapter 3. Ethnohistoric accounts document that during Inka times, *chicha* was consumed on a daily basis in moderate amounts, but large quantities of it were drunk at special occasions such as feasts (D'Altroy 2002; Betanzos 1996). Both today and in pre-hispanic times, *chicha* has played an important role in political, social, and ceremonial transactions, and as a way of rewarding *corvée* (*mita*) labor groups (Allen 1988, 2009; Bolin 1998).

Three different parts of *Zea mays* plants were identified in the botanical remains. All three reveal different things about the use of maize, and they were present in large enough quantities that they could be kept as separate categories. Maize kernels are the edible part of the plant. Once separated from the cobs, the kernels may be toasted, boiled, dried, ground, fermented, or some combination thereof to create food or drink. The kernel is technically the fruit which contains a large seed with lots of starchy endosperm. Inside the seed is the embryo, which can sprout into a new plant. Maize embryos, separate from the kernels, were also identified. These may indicate that the maize was being processed to brew *chicha* by the germination method. As described in Chapter 3, this technique involved soaking the grains, letting them sprout in the dark, and then drying them in the sun before they were ground, boiled, and fermented. Maize cupules and cobs are fragments of the non-edible inflorescence of the plant that the kernels are attached to. These are classified as non-food related, and their presence may indicate maize storage or processing rather than cooking and consumption; they also may

have been used for fuel. Fragments of maize stalks were also found, but not in large enough quantities to merit a separate category, so these were combined with fragments from other plants in the non-food related category Plant Parts.

### Tubers

The term *tuber* refers not to a particular plant, but to a type of vegetative growth in which an underground stem or root swells to form starchy storage tissue. Four different families of indigenous Andean tubers were identified, and other botanical remains which appeared to be from tuberous tissue but could not be specifically identified were classified generally as tubers. While tubers were an important food source in the Andes, they did not have the symbolic value of maize (Hastorf 1991:139). Tubers may have been prepared in a variety of ways, with boiling likely a common method. The soft, amorphous nature of tuberous tissue and its methods of preparation for food make tubers hard to recover and identify archaeologically, and it is likely that their importance is underrepresented in the paleoethnobotanical record.

Solanum tubers refer to *Solanum tuberosum*, andigena., or stem tuber potatoes. A large variety of potatoes were produced in the Andes, with a range of tolerances for different growing conditions, storage capabilities, tastes, and colors. Whereas potatoes are clearly a staple starch, the other three indigenous tubers are more like vegetables in how they are grown, consumed and viewed (Hastorf, personal communication). Oxalis tubers refers to *Oxalis tuberosa*, or oca. According to Spanish chroniclers, oca was eaten fresh, roasted, or dried in the sun and then eaten raw or stewed (Emshwiller, personal communication). Ullucus tubers refers to *Ullucus tuberosus*, commonly called ullucu or papa lisa. Tropeaolum tubers refers to *Tropeaolum tuberosum*, commonly called mashua, or isañu. Mashua looks very similar to oca, but while the oxalic acid in oca gives it a tart taste, mashua has a pungency more similar to that of a radish (Grau et al. 2003: 2). Mashua tubers are used to prepare a variety of different dishes, often together with meat and other tubers. They can be boiled, sun dried, or baked in earthen ovens (Grau et al. 2003: 23). Mashua is also reputed to have antiaphrodisiac properties, and Spanish chroniclers reported that the Inka would feed it to their troops to keep them docile (Grau et al 2003: 27).

### Quinoa

*Chenopodium quinoa* Willd. was and still is one of the most important crops in the Andes (Bruno and Whitehead 2003: 340). It is sometimes referred to as a pseudograin or pseudocereal because, although it is not a member of the grass family *Poaceae*, as other cereals are, its seeds are used in a similar manner. *Quinoa* seeds can be prepared in a variety of ways, in soups or stews, toasted and ground to make bread, or steamed in balls with fats, condiments and salt (Coe 1994: 182). Unlike maize and potatoes, *quinoa* was not readily adopted by the Spaniards, possibly due to the unpalatable outer coating of saponins on the seeds that must be removed before eating.

## Legumes

Both wild and domesticated legumes were recovered from the excavations, distinguished by the size of their seeds. Although both types may have been consumed, the domesticated legumes have been classified as food-related and wild legumes as non-food related. As will be discussed later in this chapter, exploratory data analysis tends to support this distinction, with domesticated legumes associated with other food types and wild legumes grouping with weedy seeds and dung.

Two types of domesticated legumes were identified, and those that could not be specifically identified are most likely one of these two species. *Lupinus mutabilis* Sweet, or tarhui, was most likely an important source of protein and was domesticated in the highlands. It is also used as a pest repellent due to its high alkaloid content. Its seeds had to be leached in cold running water for several days before they are eaten raw, roasted, cooked in soups, or ground into flour (Hastorf 1983: 67-69). *Phaseolus vulgaris*, the common bean, also has a long history of domestication in the Andes (Kaplan et al. 1973), but it can only be grown in the lowest zones of the study area (Hastorf 1983: 77).

## Other Food

This grouping consists of several different types of plants that were likely to have been consumed but were not present in large enough quantities to merit their own category. *Amaranthus sp.* is a pseudograin similar to *quinoa*. Its little seeds can be popped, toasted, roasted, or ground into flour (Sauer 1950). It is not always possible to distinguish between *quinoa* and amaranth seeds in archaeobotanical remains, so those that could not be indentified specifically as *quinoa* were included with amaranth in the “other food” category. Both seeds and corms from *Lepidium sp.*, or maca, were recovered. Corms are a type of tuber derived from an underground stem, and it is this part of the plant that is eaten. Maca was most often prepared in soups; it could also be eaten raw or dried in the sun, roasted, or boiled and mashed and mixed with other grains or tubers to make a flour for baking (Coe 1994: 185). Remains of lucuma fruit were also recovered. As lucuma does not grow at this high elevation, and its presence in the study area indicates that it was imported from the jungle. The seeds from *Oxalis sp.* may be from a wild member of the genus or from a domesticated oca plant. *Opuntia sp.*, or prickly pear cactus, may have been domesticated, as it has been observed sometimes to be purposefully planted around habitations (Hastorf 1983: 246). *Echinocactus sp.* is another type of cactus that may have also been used as food. *Physalis sp.* is a small, edible fruit in the tomato family, sometimes called an Inca berry, like a tomatillo of Mesoamerica.

## Scirpus

Seeds from *Scirpus/Schoenoplectus sp.*<sup>2</sup> were recovered in large enough quantities to merit their own category. Although they were originally classified as non-food related, exploratory data analysis showed that they were often associated with other food-related remains

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<sup>2</sup> Botanists have found the genus *Scirpus* to be a heterogenous group, and many of the species in the genus have been reassigned to other genera including *Schoenoplectus* (Strong 1993). Since the seeds in this study were not identified to species and the taxonomy still remains under debate, this study will use the term *Scirpus* to refer to members of the genus *Scirpus* sensu lato.

(see discussion below.) The rhizomes of the plant may have in fact been eaten by the Xauxa, and the use of species of *Scirpus* as food is recorded in ethnobotanical and archaeological reports from elsewhere in South America (Holden 1991).

### Colonial Crops

As described in Chapter 2, the excavations revealed some colonial period occupation, which was termed Wanka IV. Both *Triticum sp.*, or wheat, and *Pisum sp.*, or pea, were introduced by the Spanish and cultivated by the indigenous population. These crops are included in this study for comparative purposes.

### **Non-Food Related Categories**

Non-food related botanical items may have entered the domestic spaces for a variety of reasons, but they were less likely to have been eaten by people. Some may have been used as building materials, for containers, fuel, or in craft manufacture. Others may be weedy taxa that are associated with food crops or with disturbed areas in which people live. As discussed in Chapter 3, these plants were likely to have been used as well, and often for their medicinal properties. Although there is often not a clear distinction between food and medicine, only those plants that were likely to have been consumed as part of the diet were classified as food-related. It is important to keep in mind, therefore, that some plants considered to be non-food related by this study may have been consumed in small quantities. Other non-food related plants may have been forage for domesticated animals, whose dung was then used as fuel, causing the seeds to be carbonized and thus preserved.

### Wood

Burned wood was recovered from many samples. The remains were not further identified. Wood was most likely used as fuel, often possibly for cooking fires. As discussed below, there seems to be a distinction between wood and other types of fuel, with wood being a more highly valued commodity.

### Parenchyma

The bulk of non-woody plants consists of parenchyma with thin-walled undifferentiated cells. Amorphous burned lumps that were recovered from the flotation samples and could not be identified as a specific plant or plant part were labeled as parenchyma. It is very possible that some of these remains are in fact from the tuber crops, but without any diagnostic features to identify them. Other sources of parenchyma are plant stems, leaves, bulbs, and roots.

### Zea Cupules and Cobs

As discussed above, these are parts of *Zea mays* that are not edible. When the maize kernels are removed from the cob, these are the parts that are left behind. They may have been used as fuel, along with other plant processing by-products. Their presence in domestic contexts

may indicate that maize entered the house as cobs rather than as kernels and was processed in the home. As discussed below, *Zea* cupules and cobs tend to covary with kernels and embryos, except when there are particularly high quantities of kernels and embryos.

### Dung

Dung from both llamas and *cuys*, or guinea pigs, was recovered in the flotation samples. Although dung is not a type of botanical remain, it was included in this study to shed light on its association with the botanical remains. First, like some botanical remains, dung may have been used as fuel in the houses. Secondly, as discussed in Chapter 4, it has been proposed that many seeds from wild plant taxa enter the house not because they are being consumed by the residents, but because they were consumed by animals, whose dung was then burned as fuel (Miller 1984, 1996). Burning the dung in domestic hearths would result in the carbonization of these fodder seeds, causing them to be represented in disproportionate numbers in the domestic spaces. In their experimental investigation of modern animal dung from the Mantaro Valley as well as two other regions in South America, Hastorf and Wright (1998) found several types of seeds occurred commonly, including *Relbunium*, small and large grasses, wild legumes, *Chenopodium*, Malvaceae, Cyperaceae, and Cactaceae. As discussed below, exploratory data analysis did demonstrate that dung was often found in association with seeds from wild plant taxa.

### Large Poaceae and Small Poaceae

A variety of different grass seeds were recovered. Rather than attempting to identify them to species, they were classified as small, medium and large grasses. Large and small grasses were present in great enough numbers to merit their own separate categories, while medium grasses were included in “Other Fuel.” It is likely that many of these grasses entered the archaeobotanical record because they were used as fuel. It is also possible that grasses were used to make wrappings or containers for food storage or transportation and even as flooring and mattresses (Hastorf, personal communication).

### Other Fuel

Besides medium grasses, this category includes grass nodes, twigs, and branches. These are all plant parts that were likely used as fuel, but were not present in large enough quantities to be treated separately.

### Plant Parts

This category consists of remains that were identified by the part of the plant they came from. Many of these items may have been used as fuel, but they were kept separate from the “Other Fuel” category because it is possible that they represent other uses of the plants, such as for craft production, containers, building materials, or medicine.

### Wild Legume

Seeds from a non-domesticated member of the bean family were recovered from the flotation samples. *Trifolium amabile* is found commonly in Andean sites. It is a plant that grows in disturbed environments where livestock consume it (Brack Egg 1999). It is most likely that it entered the site in dung used for fuel (Hastorf and Wright 1998). They were numerous enough to be a separate category, rather than be combined with other wild seeds.

### Wild Seeds

This category consists of 25 different taxa, identified to differing levels of specificity, that were not likely not primarily used for consumption and were fairly rare in the archaeobotanical record. A few of them merit particular attention. *Erythroxylon coca* is the coca plant, a highly valued plant that grows at lower altitudes and would have had to have been imported. Among other uses, chewing coca leaves helps increase endurance at high altitudes (Hastorf 1987). A couple of different types of *Nicotiana sp.* grow in the highlands today, and the remains recovered from these excavations may have been a wild variety that was burned in offerings, or eaten and excreted by animals (Brack Egg 1999; Hastorf, personal communication.) *Bixa orellana*, or *achiote*, is used as a flavoring and red coloring agent in food. It also grows only in lower, moister elevations, and would have had to represent an import to the Xauxa region. Although these three plants may have been chewed, inhaled, or added as a coloring to food, they are not classified as food-related because they are not primarily consumed as part of the diet. Moreover, they were present in such small numbers at the four sites that how they are categorized has no effect on the data analysis, but their presence does emphasize the special nature of the contexts in which they were found (see discussion below.)

The roots of *Relbunium sp.* and possibly *Galium sp.* both contain purpurin and pseudopurpurin and may have been used to make red dye to color textiles (Wallert and Boytner 1996). *Relbunium* may have also entered the site through camelid dung that was burned as fuel, especially given that Hastorf and Wright (1998) found it to be disproportionately represented in modern camelid dung. Along with *Galium sp.*, *Ambrosia sp.* grows in open grasslands, while *Eleocharis sp.* and members of the Polygonaceae and Cyperaceae families are found along wet shorelines, and *Salvia sp.* grows in moist, protected soils (Hastorf 1983: 248). Some members of the Compositae, or Asteraceae, family are pungent and may have been burned in offerings along with *Nicotiana sp.* (Hastorf, personal communication.)

### Unidentified Seeds

Many of the botanical remains could be recognized as seeds but could not be identified taxonomically, due to distortion, fragmentation, or poor preservation.

## VARIABLES USED IN THE ANALYSIS

Exploratory data analysis was used to look for patterns in the deposition of plant remains within the domestic structures. The flotation data set consists of 1097 flotation samples, which were recovered and processed according to the procedures described in Chapter 4. A complementary botanical data set of items recovered from the screens consists of 384 samples. The goal of the analysis was to look for relationships between the profiles of the samples and their contexts.

### Context Variables

The context of each sample can be described by several different categorical variables:

**Site (4):** Each flotation sample comes from one of four different sites, as described in Chapter 2.

**Patio group (28):** At each of the four sites, six to nine different patio groups were excavated, for a total number of twenty-eight. As described in Chapter 2, each patio group (or Architectural Division, abbreviated Adiv) is thought to have functioned as a household.

**Architectural Subdivision (153):** Each patio group consists of one to seven round or rectangular enclosed structures, arranged around an open air patio. As described in Chapter 2, the enclosed structures in each patio group were numbered sequentially as architectural subdivisions (abbreviated Arcsub, or ASD.) The patios were divided into smaller spaces approximately along a grid, and each of these spaces was likewise numbered as an architectural subdivision. Architectural subdivisions therefore allow us to examine variation within each patio group. ASDs that refer to enclosed structures may be discrete, culturally meaningful divisions, but the patio ASDs are arbitrary designations. Variations in the patio ASDs, however, may reflect differential use of space in the patios.

**ASD Type (2):** The architectural subdivisions of each patio group were classified either as a Structure or Patio. This allows for the comparison of the use of enclosed versus open spaces within and across patio groups.

**Status (2):** Each occupational phase of every patio group was assigned a status of either Elite or Commoner at the time of excavation. As described in Chapter 2, the designation was based on size, quality of masonry, quantity and quality of artifacts, and subsequent analysis has tended to support the assignments.

**Phase (3):** Each of the samples analyzed can be dated to one of three time period (Wanka II, III, or IV.) As described in Chapter 2, the focus of the UMARP research and of this study is

on Wanka II and III, the two phases immediately before and after the Inka conquest. Samples dated to Wanka IV, the colonial period, are more rare and only exist at two of the sites.

**Cultural Context Category (16):** Every provenience excavated was assigned a cultural context at the time of excavation which reflected the excavator's interpretation of its depositional environment (see Table 5.2). These designations were sometimes revised during post-excavation analysis, as the stratigraphy or other information about the context became more clear. Seventy-three different cultural contexts were defined for use by UMARP in seven basic categories (surface, wall, midden, cultural surface, feature, burial, and fill.) In this study, the cultural context categories are used as the analytical units, with the exception of the feature category. Contexts in this category (such as hearth, kiln, stairway, and pit) are treated separately because they are in fact quite different.

### Sample Profiles

The sample profiles consist of counts of all of the different botanical items recovered and identified in each sample. A total of about 70 different item types were recovered, many of them appeared rarely. The diversity of the flotation samples, or number of different items identified in each one, varies greatly. About five item types appear in the majority of the flotation samples.

**Botanical Categories (18):** In designating the units of analysis for the sample profile, it was desirable to strike a balance between diversity and consistency. A large enough number of analytical units were needed to compare with each other to elucidate trends, but too many rare items would create a data set consisting mostly of zero counts and skew the analysis. Therefore the 70 different botanical item types identified were combined into 18 categories described above (see also Table 5.1). Items from each of these categories are present in an average of 25% of the total samples (minimum 1%, maximum 77%). Each category has an average of about 8000 items (median = 1518, minimum 96, maximum 53,000.) These categories should not be taken as definitive or exclusive, but rather as an attempt to group the data in a way that best achieves the balance between diversity and consistency. A further iteration of data analysis beyond the scope of this project could reorganize or refine these botanical categories.

**Food vs. Non-Food (2):** As described above, each of these botanical categories was further classified as food-related or non-food related (see Table 5.1). Like the categories, this is not a definitive or exclusive classification, but a hypothesis based on the best information available. For ease of visual analysis, all food-related categories are CAPITALIZED in the tables and charts, and non-food related categories are written in lower case letters.

### Transforming the Raw Counts

As described in Chapter 4, raw counts are not particularly helpful in comparing different types of botanical remains from different samples. A modified version of *standardized density*

was used for the majority of the correspondence analyses implemented in this study. For each analysis, the total count for each botanical category was divided by the total volume of soil sampled, and then multiplied by a factor that allowed almost all of the resulting standardized densities to be greater than 1. For example, one of the first analyses discussed below is a regional analysis comparing the botanical profile of each site. The counts of items belonging to each botanical category were totalled for each site and divided by the total volume of soil floated at that site. A multiplication factor was chosen that was close to the average total volume of soil floated at each site, so that almost all of the numbers used in the correspondence analysis were greater than 1. This was necessary because correspondence analysis tends to treat fractions less than 1 as zero counts, which would have skewed the results. As long as all of the numbers are greater than 1, however, the results of the correspondence analysis are not affected by the choice of multiplication factors. The resulting standardized density allows for comparison between sites even when, for instance, the total volume of flotation samples taken at Tunanmarca was twice of those taken at Umpamalca. As described in Chapter 4, correspondence analysis helps control for systematic differences between the different botanical categories.

A modified version of *ubiquities* was also used for some of the correspondence analyses, but these tended not to be as informative as the standardized densities. For each analysis, each botanical category was given a score of 1 if it was present in any of the samples from the analytical unit, and zero if it was absent. For example, returning to the regional analysis by site, each botanical category was scored as present or absent at each of the four sites. This version of ubiquities tended to emphasize the similarities among the units of analysis. As discussed below in more detail, the Xauxa seem to have used the same complex of plants in similar ways across space and over time, with differences mostly in the amounts that were used. Correspondence analysis with ubiquities illustrates the similarities clearly, and standardized densities are needed to reveal the more subtle variations.

*Ratios* were also used to look at possible correlations between different types of plant remains, regardless of context. The count of one type of botanical remain was plotted against the count of another type of botanical remain in each of the samples. Most remains analyzed in this way were found to be positively correlated with everything else, as richer samples tended to have more of everything, but some trends were found using ratios that are discussed below.

## REGIONAL ANALYSIS

The following discussion draws on the flotation data set to examine trends in the botanical data evident at the regional level, incorporating all four sites.

### Associations With and Among Food-Related Botanical Categories

#### By Site

Figure 5.1 shows a correspondence analysis of the botanical categories by site. Food-related botanical categories are capitalized. The analysis shows a fairly clear grouping of food-related categories, marked by the oval drawn around them. Maize kernels, maize embryos, and other food are tightly clustered, with *quinoa*, legumes, tubers, and *Scirpus* forming another tight group very close by. Most of the non-food related botanical categories are spread above the food

grouping along the vertical axis. Interestingly, the few colonial crops are at the far end of that spread, distant from all of the other food-related categories.

The chart not only shows a distinct food-related grouping, but it demonstrates a strong association between two sites and these food-related plants. Both Umpamalca and Tunanmarca are plotted within the grouping, with the former more closely associated with the maize kernels, embryos, and other food cluster, and the latter closer to *quinoa*, legumes, tubers, and *Scirpus*. Marca and Hatunmarca both appear within the non-food related spread, not because they are lacking in food-related botanical items, but because it seems that a much greater proportion of food versus non-food related botanical items were found at Umpamalca and Tunanmarca. The distribution of the four sites on the chart helps clarify where colonial crops are plotted: only Marca and Hatunmarca have Wanka IV occupations from which these items could have possibly been recovered.

The strong association with these two sites and food-related plants is driven primarily by two patio groups. 7=2 at Tunanmarca and 41=1 at Umpamalca are both large, elite domestic compounds (see descriptions in Chapter 2) from which very high densities of food-related botanical remains were recovered. Figure 5.2 shows the same correspondence analysis of botanical categories by site, but excludes these two patio groups from the analysis. While the two sites still plot fairly near each other, the distinct grouping of food-related botanical categories is no longer apparent. Together, these two plots illustrate how different patio groups 7=2 and 41=1 are from all of the other patio groups excavated with regard to food-related botanical remains. As discussed below, this study argues that these compounds may have been used to prepare and host large feasts, in which Wanka II leaders entertained a suprafamily group with large amounts of *chicha* and specially prepared foods.

### By Patio Group

Even though the trends discussed above seem to be driven by two specific patio groups, a correspondence analysis of botanical categories by patio group (Figure 5.3) acts more to underline the similarities across all of the domestic compounds rather than the uniqueness of 7=2 and 41=1. Almost all of the botanical categories and patio groups form a tight cluster at the origin of the chart. Maize kernels, maize embryos, and other food are somewhat distinct from that cluster and visibly associated with 41=1, although they do not appear related to other food-related categories. Looking at Tunanmarca, 7=2 is buried within the cluster, but patio group 7=5 is pulled out from the cluster by dung. Other analyses also demonstrate that 7=5 has a distinct non-food related artifact assemblage, and will be discussed further below.

### By Site-Phase

Figure 5.4 shows a correspondence analysis of the botanical categories by occupational phase for each site. It demonstrates that there is generally more continuity within a site over time than resemblance among different sites during same time period. The configuration of the chart is very similar to that of Figure 5.1, which shows the same analysis by site alone, but here the food-related grouping is even more clear, and its association with Tunanmarca and Umpamalca even stronger. While it may be tempting to explain this as due to both being single occupation Wanka II sites, it appears that Wanka II Hatunmarca is quite distinct from its contemporaries.

As explained in Chapter 2, Tunanmarca and Hatunmarca are thought to have been the major Wanka II regional centers, with Umpamalca functioning as a subsidiary site of Tunanmarca. Three elite Wanka II occupation patio groups were excavated at Hatunmarca, and while at least one was found to contain a large number of ceramics related to cooking, storage and serving (Earle et al. 1985:64), this analysis shows that the botanical assemblages recovered at Tunanmarca and Umpamalca were more characterized by food-related remains than that of contemporary Wanka II Hatunmarca.

Interestingly, Hatunmarca trends towards the food-related grouping over time, possibly because the amount of maize increases after the Inka conquest. Marca, on the other hand, stays remarkably constant from Wanka III to IV, and both Marca occupations are plotted closer to Wanka II Hatunmarca than their corresponding phases at Hatunmarca. Of the four sites, Marca was the only one established during Inka rule (although on an earlier Wanka I occupation), and it was located on the farthest east side of the Yanamarca Valley, directly above the Inka administrative center of Hatun Xauxa and overlooking the Inka road, with direct access to the main Mantaro Valley. As discussed in more detail below, these factors may have contributed to distinctive characteristics in the site's botanical assemblage. Although the abundance and relative importance of maize increases in Wanka III under Inka rule (Hastorf 1990, 2001; Hastorf and Johannessen 1993), this analysis shows that it is Wanka II sites that have the strongest association with maize as well as other food-related botanical remains. If this association is indeed due to feasting activities at certain elite households, this may point to an important change in local Xauxa political structure under Inka rule, as the responsibility for feasts was removed from the households of local elites and taken on by the Inka state.

### By Status

An analysis by status also shows a marked difference between food and non-food related botanical remains (Figure 5.5). Since there are only two context variables (Elite/Commoner), the correspondence analysis plots along only one axis, but there is a clear separation between the two statuses and a fairly distinct food-related grouping. Contexts designated as elite are associated with food-related botanical remains. This analysis lends support to the status assignments made at excavation, or the revisions made after preliminary artifact analysis, by demonstrating a distinct difference in the botanical assemblages of elite and commoner households, indicating possible differences in activities related to food preparation, storage, and consumption.

### By ASD Type

An analysis by ASD type likewise shows a marked difference between food and non-food related botanical remains (Figure 5.6). Again, there are only two context variables: structure and patio. There is a strong association between most food-related remains and enclosed structures, and open patios are associated with non-food related remains.

*Quinoa*, however, plots just between structures and patios. There are several possible reasons for this. One is that *quinoa* simply may have been used in both locations, unlike other food items which were prepared or consumed inside structures. Another is that the items identified as *Chenopodium* may in fact be a mixture of larger seeded, domesticated *quinoa*, and a smaller seeded wild *Chenopodium* (Hastorf, personal communication; Bruno and Whitehead

2003). This would mean that the category would include both food and non-food related botanical remains, which may have different depositional contexts. A third possibility is that the small, round seeds of *quinoa* (domesticated or not) are simply more likely than other types of botanical remains to have rolled and scattered everywhere around household compound, regardless of where they were prepared or consumed. In her ethnoarchaeological studies of contemporary households in the Mantaro Valley, Sikkink (2001) found that *quinoa* was virtually absent from samples in one household where it was not grown, but had a particularly high ubiquity in samples from the other households, and particularly the one with generally messy housekeeping.

It is also interesting to note that, although the majority of features identified as hearths were found inside enclosed structures, most possible fuel (wood, dung, and other fuel) are all closely associated with patios. This may indicate that fuel was stored or disposed of in the open patio, even if it was burned most often inside structures. Likewise, maize cupules and cobs strongly associated with patios, while the edible kernels and embryos are found in structures.

### By Cultural Context

One objective of this study was to investigate possible patterns in the deposition of botanical remains by cultural context that might reflect different activities that were performed habitually in different types of locations. It is difficult to determine if there is any discernable patterning of botanical categories related to the cultural context categories at the regional level, however (Figure 5.7). While an oval can perhaps be drawn around most food-related categories, they are spread out enough from each other and close enough to non-food related categories that the support for this grouping is questionable. The cultural contexts most associated with this possible grouping are fill, burials, and cultural surfaces. As is discussed below in the analysis of each site, this association is hardly consistent across sites or even patio groups. This may be a reflection of the way in which the Xauxa carried out their domestic tasks, with no strong regional conventions for the proper places in which to do certain crafts, process plants, prepare food or consume it, and, most importantly, dispose of their waste products. It may also be possible that patterning would be more evident if the spatial analysis were done differently. Focusing on cultural surfaces, middens, and fill, for instance, and dividing those by locations relative to structures, patios, doorways, and walls, may create a better picture of how the Xauxa tended to use their domestic spaces.

### **Maize Processing and Consumption**

As explained above, items identified as *Zea mays* were further divided into different categories according to the part of the plant they represented. This is because distinguishing between the edible kernels or embryos and the inedible cupules and cobs can help archaeobotanists distinguish among agricultural production, processing, and consumption (Hastorf 1990, 1991; Hastorf and Johannessen 1993). The presence of cupules and cobs indicates that maize was likely brought to the area on the cob and the kernels were subsequently removed. Cupules and cobs, as processing by-products, may have then been burned for fuel. Maize may have been stored and dried as whole cobs near the fields or within domestic structures, but since cobs are more bulky to transport, the kernels are more likely to be removed

for transport the farther one is from the site of production in the fields. While it is unlikely that cupules and cobs would have been deposited far from where they were processed, the edible products may have been cooked and consumed close by or far away from the processing site.

Figure 5.8 shows a regression analysis of maize kernels and embryos versus cupules and cobs. The graph shows a positive correlation until the numbers of kernels and embryos become particularly high, at which point the correlation becomes negative. This means that for the most part, both the edible parts of maize and its by-products are found together, indicating that processing and cooking or consumption were done at the same location. It is likely, therefore, that maize was usually brought into the domestic compounds on the cob, and possibly stored that way, until members of the household processed and prepared it. However, where the amounts of kernels and embryos were particularly high, the amounts of by-products found with them decline steeply. This may indicate that when very large amounts of maize was involved, preparation and consumption happened at a location separate from where the maize was processed. This may be the case for feasts, in which the host household calls on other households for labor and supplies. The maize may have been processed in other patio groups and brought to the host compound as kernels, where among other possible preparations, it was ground and fermented and made into *chicha*.

### **The Use of *Scirpus* as Food**

Members of the genus *Scirpus/Schoenoplectus* are grass-like plants in the sedge family (Cyperaceae) that grow in wetlands or moist soils. Remains of *Scirpus sp.* were recovered in great enough quantities for it to be treated as its own category, but it was originally classified as non-food related because it was assumed to be like other weedy taxa. Exploratory data analysis suggested otherwise, however, indicating that *Scirpus* remains are often found associated with other food-related plants. This is demonstrated most clearly in Figures 5.1, 5.4, 5.5, and 5.6. Regression analyses of *Scirpus* versus food-related remains (Figure 5.9) and versus non-food related remains (Figure 5.10) confirm this trend. While both show a positive correlation (consistent with the overall trend of richer samples having more of everything), *Scirpus* is more strongly correlated with food-related remains.

There are several possible explanations for this association. *Scirpus* plants may have been used in the storage or preparation of food, as the stalks are often used in roof, mat or basket making. *Scirpus* remains may have entered the domestic compounds unintentionally as a weedy taxon associated with certain crops. This seems unlikely, however, because the plant is usually found in marshy wetlands around lakes rather than in the zones where the crop plants were grown. Leaves or stems may have been woven together to make baskets or bags to hold stores of maize, *quinoa*, tubers, or legumes, or to create mats for roasting or displaying the cooked food. Costin (1986) describes possible nonceramic equivalents for long-term storage in the Wanka region, noting that dry goods could have been stored in baskets made from reeds. But a third possibility is that *Scirpus* itself was eaten as food. According to Holden (1991):

There is a substantial ethnobotanical literature on the use of species of *Scirpus* in northern Chile (e.g. Browman 1983; Yacovleff and Herrera 1934). There are also numerous reports of these being recovered from archaeological sites (e.g. Núñez and Hall 1982; Núñez 1981; Towle 1961; Williams 1980). The majority of these reports, however, refer to the more succulent species of *Scirpus*

*californicus* var. *tatora* (after the naming convention of Koyama 1963), known locally as totora. Browman (1983) reports that the tubers and the basal parts of the stem of totora are still consumed as a special dish at fiestas in modern Bolivia and it has evidently been used as a food resource throughout much of its range. (p325)

Holden reports that remains of *Scirpus* were recovered in flotation samples from excavations at the Formative site of Tulán in Northern Chile. The identification of *Scirpus* remains in gut and coprolite samples from Tulán, however, provided the most direct evidence for its consumption. While it is the tubers of these plants that were likely eaten, many different parts of the plant were found, and in his view it is probable that the whole plant was brought into the site for processing (p. 326).

Although little is known about how *Scirpus* may have been cooked and eaten in South America, Holden cites other recorded examples of its preparation:

The available data relating to the preparation and consumption of *Schoenoplectus/Scirpus* tubers are sparse but there are a few other examples of the use of these genera from North America. Bean and Saubel (1972), for example, record that the Cahuilla Indians ground the tubers of a species of *Scirpus* into a sweet tasting flour. Various other ethnographic data also exist for the processing of similar tuber bearing genera, notably, *Cyperus* from Africa, India and Australia. These include roasting and rubbing to remove the fibrous skin and also drying followed by grinding into flour (Hillman et al. 1989). (p. 326)

It seems plausible, therefore, that remains of *Scirpus* are found in association with other food-related remains in Xauxa household compounds because it was in fact being prepared and consumed as food. If this was indeed the case, then the presence of *Scirpus* is significant not only as an otherwise unidentified food source, but unlike the other major food plants it was not a fully domesticated crop. *Scirpus* would therefore be the most ubiquitous wild or gathered food source at the sites.

### **Different Types of Fuel Sources**

Another interesting trend that emerged from the exploratory data analysis is a possible distinction between different types of fuel sources. As described above, many of the non-food related plant remains may have been carbonized because they were used as fuel. A correspondence analysis of the botanical remains by status, however, shows that not all fuel types may have been considered equal (Figure 5.5). Commoner contexts are strongly associated with dung and other fuel, while wood plots much more closely to elite contexts and the general grouping of food-related remains. This would imply that elite households may have had preferential access to wood as a more valuable fuel source, and the less wealthy and powerful households would have had to rely more heavily on animal dung, twigs, and grasses.

## **Presence of Coca and *Achiote***

Some plant taxa were recovered too rarely for their counts to have any impact on the statistical analysis, but their presence is quite significant. A small number of remains from both coca (*Erythroxylum coca*) and *achiote* (*Bixa orellana*) were recovered in flotation samples from the two elite patio groups 7=2 and 41=1, the households that this study argues may have hosted large feasts. Both plants are highly valued and not grown locally, but must have been specially brought in to the region from lower, warmer elevations on the eastern slopes of the Andes. According to ethnohistoric documents, coca and other special goods were produced for the Wanka at outposts in the eastern Andean cloud forests, or *ceja de montaña*, during the Late Horizon (Hastorf 1987). Whether these outposts exist prior to the Inka conquest, and the extent to which local elites maintained control of them under Inka rule, remain topics of debate. Hastorf (1987) argues that the presence of coca in elite Wanka II contexts provides evidence that these *ceja de montaña* outposts were indeed established before the Inka conquest, and that the local Wanka II leaders benefitted from preferential access to coca production.

The presence of coca in 7=2 and both coca and *achiote* in 41=1 serves to emphasize the special status of these households, and helps support the hypothesis that the large number of food-related botanical remains found in the compounds represents feasting activities. Both are methods of displaying power by using access to labor to transform material wealth into high value goods. As Hastorf (1987) argues, the fact that no coca (or *achiote*) was recovered from Wanka III contexts suggests that, just as it appears that the Inka took over the responsibility for feasting from local Xauxa leaders, the Inka likewise may have gained control over access to the production of special goods in the *ceja de montaña* outposts.

## **THE SCREEN DATA SET**

The majority of the paleoethnobotanical data comes from systematic flotation samples, as described above. Excavators also collected any charred organic remains from the general excavations that were observed when the soil was sifted through the ¼ inch screens. This can be an informative data set, but it cannot be combined with the flotation data set because both the method of sampling and the collection bias are different. The screen data set theoretically represents botanical remains present in all of the normally excavated soil, but scanning for small charred remains in the screens is not a very consistent way to do the collection. The thoroughness may vary greatly among excavators, as well as by day, by context, and by soil matrix. (The consistency of the UMARP screen data set across these different factors has not been tested, but the data is available to do such a study, which could be quite informative for designing future paleoethnobotanical collection protocols.) The data set is also systematically biased towards large remains that are big enough to catch the excavator's eye and not fall through the ¼ inch screen. Plants with small seeds, such as *quinoa*, are either absent or rare, while plants with large, recognizable seeds, such as maize kernels, are overrepresented.

With these cautions in mind, botanical materials collected from the screens still provides an interesting complementary data set to the flotation data. It can be used as a related line of evidence to support the findings of the flotation data set, and it may be useful for recovering rare taxa that did not happen to be deposited in any of the floated soil.

In order to analyze the screen data, the raw counts first had to be transformed into standardized densities, similar to those of the flotation data. For each level of analysis, the total counts were divided by the total volume of soil excavated (and therefore screened), and multiplied by a factor so that all of the final densities were greater than 1. Figure 5.11 shows (a) the total densities of each botanical category, and (b) the densities by site. The same item categories were used, but not all of the ones present in the flotation samples were recovered in the screens. As expected, the screen data is heavily biased towards maize, as well as large fragments of wood, tubers, and parenchyma. *Quinoa* and other organic materials are present, but in greatly reduced amounts. The charts are drawn with a log scale for the densities to accommodate the large range.

Despite these differences, analysis of the screen data mostly serves to support the analysis of the flotation data. A correspondence analysis of the screen botanicals by site (Figure 5.12) shows a similar configuration to that of the flotation data by site (Figure 5.1). Maize kernels, embryos and *quinoa* (obscured) are tightly clustered close to Umpamalca, and together they form a looser grouping with tubers and legumes, near Tunanmarca. The similarities between the flotation and screen data sets are even more apparent in a correspondence analysis of both flot and screen derived botanical categories by site (Figure 5.13). The configuration of the chart is quite consistent, and botanical items from the flotation samples (marked with the prefix 'F') are usually plotted quite close to the corresponding items from the screens (marked with the prefix 'S'). Thus, the food-related grouping associated again with the Wanka II sites of Umpamalca and Tunanmarca is supported by the screen data set. This association is also driven by the two elite patio groups 7=2 and 41=1, and so the results of the screen data set help confirm the uniquely food-related composition of these domestic compounds. This lends support to the argument that these patio groups were the sites of feasting events, where large amounts of food were prepared and consumed.

## SITE-LEVEL ANALYSIS

An examination of patterns in the deposition of botanical remains at each of the four sites highlights the ways in which they both correspond with and deviate from the regional trends discussed above.

### **Tunanmarca**

#### By Patio Group

Correspondence analysis of the botanical categories by patio group at Tunanmarca builds on some of the findings from the regional analysis (Figure 5.14). The hypothesized feasting household, patio group 7=2, is distinguished for its association with a clear grouping of food-related remains. Along with maize, *quinoa*, legumes, and tubers, both *Scirpus* and wood are found in particularly large proportions in this domestic compound. Interestingly, items categorized as "other food" are not well represented in this patio group. This may point to a distinction in the values of different food items: while wild or semi-cultivated edible items such as maca, amaranth, *Opuntia* cactus, lucuma fruit, and others may have been part of the every day Xauxa diet in small amounts, they were less likely to have been used for feasts, which called for the special preparation of large quantities of domesticated crop plants. Perhaps in support of

this, it is three of the major crops (maize, *quinoa*, and legumes) that most distinguish 7=2 from the other patio groups.

Commoner patio group 7=5 is also clearly set apart by this analysis, for completely different reasons. It appears to be pulled out from the other patio groups by a particularly large amount of dung, and it is also associated with wild seeds, wild legumes, and unidentified seeds. As mentioned in the patio group description in Chapter 2, camelid dung was found in a small pit in the patio of 7=5, indicating that it may have been stored there for use as fuel. Its strong association with weedy seed taxa, also recovered mostly from samples in the same ASD (7=5-52), lends support to the theory that these may be fodder plants whose seeds enter the domestic spaces by way of animal dung used as fuel.

The patio groups excavated at Tunanmarca varied greatly in the density of their botanical deposits (Figure 5.15). Samples from patio group 7=2 were by far the most dense, indicating that this household was distinguished not only by the composition but also by the sheer number of its botanical remains. This follows if the remains are indeed a reflection of feasting activities, since feasts may be visible archaeologically by the large quantities of remains as well as their types. Samples from 7=2 average twice as many botanical remains as samples from the next most dense commoner patio group, 7=9, which in turn are twice at least twice as dense as samples from all of the other patio groups. Differences in density do not always correspond with difference in composition of the assemblage, however. Patio groups 7=9 and 7=4, both commoner compounds that vary greatly in density, plot almost on top of each other in the correspondence analysis (Figure 5.14), indicating that the compositions of their botanical assemblages are very similar. This lends support to the argument that, except in certain cases such as feasts, the residents of Tunanmarca used the same plants in similar ways in their domestic spaces.

### By Status

Correspondence analysis of botanical remains by status at Tunanmarca again shows the most clear distinction between food-related and non-food related items (Figure 5.16). Elite contexts are closely associated with maize kernels and embryos, legumes, *quinoa*, and *Scirpus*, as well as high-value wood fuel. While tubers also appear to be more closely associated with elite contexts, they are plotted between elite and commoners. Interestingly, although the edible parts of maize are clearly associated with elite contexts, maize cupules and cobs also plot between elite and commoner contexts. This indicates that maize processing may have been done in all households, but the products of the processing were likely to have been brought to the elite compounds for preparation and consumption. Commoner contexts are closely associated with low-value dung fuel and other food, strengthening the argument that the wild or semi-cultivated items that may have supplemented the diet were not considered to be of high value.

### By Structure Type

Correspondence analysis of botanical remains by structure type shows an interesting division between types of food items (Figure 5.17). While the regional analysis showed a fairly strong association between food remains and enclosed structures (Figure 5.6), open patios at Tunanmarca are clearly associated with maize kernels and embryos, as well as other food. While

the analyses above have demonstrated that items categorized as “other food” were likely not part of elite-hosted feasts, the association of maize food products with the patio space at Tunanmarca may shed light on the special feasting activities that this study argues took place there. As described in Chapter 3, women from several different households may have gathered in the patio of 7=2 with their grinding stones and ollas to grind and soak the maize to prepare *chicha* for several days before a feast towards the end of the compound’s life. This scenario seems plausible, but even if the patio spaces were used by a large gathering of women for maize grinding, that does not explain how the charred remains were deposited in these open spaces. Another possible explanation follows van der Veen and Jones’s (2006) argument that a greater quantity of charred remains recovered simply reflects greater quantities of botanical items, since accidents and waste are simply more likely to occur in places where more food-related activities are happening. If a particularly large volume of maize was prepared and cooked at Tunanmarca for feasts, specifically at patio group 7=2, occasional accidents may have resulted in a large quantity of charred kernels, which may have been disposed of in patio middens.

## **Umpamalca**

### By Patio Group

Correspondence analysis of botanical remains at Umpamalca by patio group highlight the strong food association of 41=1 (Figure 5.18). Like 7=2 at Tunanmarca, it is hypothesized that the botanical remains at this domestic compound may reflect final feasting activities carried out by local Wanka II leaders. There are some differences between the deposits in these two structures, however. While both are strongly associated with maize kernels and embryos, *quinoa*, and legumes, 41=1 is also associated with wild or semi-cultivated plants categorized as “other food”. And while tubers, *Scirpus*, and high-value fuel wood group closely with 7=2, they have no particular association with 41=1. Interestingly, Tunanmarca overlooks the Yanamarca lake with a large marshy area where *Scirpus* would have been growing.

The other elite patio group that was excavated at Umpamalca, 41=8, also stands out on the chart and plots near the food-related grouping that surrounds 41=1. This may be due in part to the large ash dumping with *quinoa* that was found just to the east of the doorway of the compound. The analysis also supports the classification of patio group 41=6 as a commoner compound. As described in Chapter 2, the patio group was originally selected for excavation as an elite compound on the basis of its size and the quality of its masonry, but the artifacts recovered from it did not indicate an elite occupation. 41=6 plots near a cluster of other commoner patio groups, and its botanical assemblage is most characterized by dung and other fuel.

### By Status

Correspondence analysis of the botanical categories by status at Umpamalca confirms the food-related associations of the two elite patio groups, 41=1 and 41=8 (Figure 5.19). Elite contexts are associated with a tight grouping of maize kernels and embryos, legumes, *quinoa*, and other food, as well as small grasses. Commoner contexts are clearly associated with dung and other fuel. As in Tunanmarca, maize cupules and cobs plot between the two statuses,

although slightly closer to commoner, indicating that maize processing was likely done by every household.

### By ASD

Correspondence analysis by architectural subdivision show that it is several different contexts in patio group 41=1 that have a particular association with food-related remains (Figure 5.20). Structure 2 and patio ASD 41=3-55 (41=2 and 41=3 patios adjacent to the main patio and considered part of 41=1) are associated with maize kernels and embryos, legumes, other food, and *Scirpus*, while Structure 3 and two other patio ASDs (41=1-51 and 41=1-52) are plotted near *quinoa*. Two patio ASDs from 41=8 are also distinguished by their association with *quinoa*. The rest of the ASDs form a tight cluster with most of the other botanical remains, including tubers.

### By Cultural Context

Correspondence analysis by cultural context highlights another difference between the assemblages at Umpamalca and Tunanmarca, and specifically 41=1 and 7=2 (Figure 5.21). As discussed above, most analyses by cultural context did not reveal any distinct patterning in the botanical remains. At Umpamalca, however, maize kernels, maize embryos, and legumes are strongly associated with fill. This is driven largely by subfloor fill deposits that were recovered in 41=1-2, reflecting a cooking event completed nearby before Structure 2 was constructed. Although the above analysis by ASD shows that food-related remains were also found in other locations in the patio group, it appears that these fill deposits account for the majority of the maize and legume remains. This is quite a different depositional history from patio group 7=2 at Tunanmarca, where most food-related remains were found in contexts associated with the contemporaneous occupation of the compound. The unusually large amount of charred food-related remains found in the fill below the floor in Structure 2 may indeed reflect earlier feasting at Umpamalca, but the activities that created these remains would have had to occurred prior to the floor of the structure being built. Although there is some evidence for construction episodes in the patio group, which may have joined the three neighboring patios together, the excavation notes do not indicate a later construction date for the floor of Structure 2, so these deposits likely pre-date the occupation of 41=1 entirely. As Hastorf (1991) argues, though, the patio group is located in the middle of an elite zone, and it is likely that the fill materials for the floor were not transported very far. Other artifacts found in the patio group in non-fill contexts, such as high-value or special use botanical remains of coca, *achiote*, and *Nicotiana sp.*, as well as a possibly large number of grinding stones, indicate that the residents of 41=1 may have held a similar social and political role at Umpamalca as the residents of 7=2 at Tunanmarca. It is plausible therefore that the construction fill of their compound may have incorporated refuse from previous feasts held nearby and perhaps even socially connected with the household.

### **Hatunmarca**

During its Wanka II occupation, Hatunmarca is thought to have been the center of a southern alliance of smaller sites in the Yanamarca Valley. While the northern alliance sites of Tunanmarca and Umpamalca were abandoned after the Inka conquest, Hatunmarca continued to

be occupied under Inka rule, and into Spanish colonial times. It is possible that the local Xauxa leaders at Hatunmarca chose a political strategy of appeasement and cooperation, while the northern alliance leaders mounted an unsuccessful resistance against the Inka, only to have their settlements completely dismantled (Hastorf, personal communication). The botanical assemblage at Hatunmarca in all three phases of its occupation closely resembles those of Tunanmarca and Umpamalca in overall composition, but its distribution is quite different.

### By Phase

Since many of the patio groups at Hatunmarca show multi-phase occupations, it is helpful to examine the botanical profiles of the different contexts sampled by phase (Figure 5.22). Correspondence analysis shows an increased association with high-value food crops over time. Wanka IV contexts plot most closely to a possible grouping of maize kernels, maize embryos, legumes, and colonial crops. Wanka III contexts are closer to this grouping than Wanka II contexts, as well as slightly closer to tubers and other food, and *quinoa* plots directly between them.

### By Patio Group

Correspondence analysis of botanical remains at Hatunmarca by patio group over all three phases indicates little variation in the distribution of different plants, with no possible food-related feasting signature as in 7=2 or 41=1 (Figure 5.23). Almost all of the botanical remains form a tight cluster on the chart, with little distinction between food-related and non-food related plants. The two patio groups associated with this cluster are both elite domestic compounds located on the southern knoll of the site. 2=3 was occupied through all three phases, and 2=1 was occupied during Wanka III and IV.

Wood and *quinoa* are distant from the botanical cluster, as are at least three of the patio groups. The only two exclusively commoner patio groups, 2=2 (Wanka III) and 2=4 (Wanka II) are plotted fairly separate from each other and the most different from the cluster of plant remains.

### By Status-Phase

The trends described above are clarified by a correspondence analysis by status and phase together at Hatunmarca (Figure 5.24). Elite contexts are clearly associated with the majority of both food- and non-food related botanical remains, and their assemblages become more food-related over time. Commoner contexts are remarkably stable from Wanka II to III, both showing little association with any plant remains except for *quinoa* and wood.

### By ASD

Looking at the deposition of botanical remains by architectural subdivision across the site distinguishes several contexts in patio group 2=1, but for their wild rather than domestic assemblages (Figure 5.25). The majority of ASDs and botanical categories form a tight cluster in the center of the chart, indicating an overall similarity across contexts. A spread of wild,

semi-cultivated, and weedy taxa stands apart from this cluster (wild seeds, wild legumes, large and small grasses, unidentified seeds, and other fuel, as well as the non-crop food categories of “other food” and *Scirpus*.) Three patio ASDs from patio group 2=1 (2=1-51, 2=1-52, and 2=1-53) and two structures (2=1-1 and 2=1-11) are associated with this spread. Structure 11 is of particular note because it is a rectangular structure rather than the typical circular structures found in most patio groups. Inka-influenced rectangular structures appear during Wanka III, but their artifact assemblages have not supported any special function for them within the patio groups (Costin 1986; D’Altroy 1981). Most of the artifacts recovered from this structure appear to date from the Spanish colonial period.

### By ASD Type

Correspondence analysis of botanical remains at Hatunmarca by ASD type shows that both structures and patios are associated with food-related plants, but with different types (Figure 5.26). Patios are more associated with high-value crop plants, such as maize, while structures have more non-food related and wild food taxa, as well as lower-value tubers. As at Tunanmarca, this might reflect maize and other crop food preparation happening on a larger scale in patio spaces, or it may reflect food disposal events in the patios, but from the results of the other analysis it appears that these activities were not taking place during Wanka II, but rather during Wanka IV under Spanish rule. The consistent association of colonial crops with maize remains in elite patio contexts may indicate that a high value placed on these European imports in addition to maize in Wanka IV.

It is also clear from this analysis that all maize parts, including the inedible by-products, are associated with patio contexts at Hatunmarca. Similarly, maize cupules and cobs plot closely to maize kernels and embryos in elite contexts at Hatunmarca (Figure 5.24). This trend differs from those seen at Tunanmarca and Umpamalca, where maize processing by-products appeared to be fairly evenly distributed across contexts, independent from deposits of kernels and embryos.

### Interpreting Hatunmarca

At first glance, the botanical assemblage of Hatunmarca is the same as those at the other sites because the same range and diversity of taxa are represented. The patterning of the deposition of remains at Hatunmarca differs from what we have seen at Tunanmarca and Umpamalca, however. Most saliently, even though three elite Wanka II occupations were sampled, none of the pre-Inka patio groups showed anything close to the strong food-related groupings that have been interpreted as evidence of feasting at Tunanmarca and Umpamalca. It is possible that similar feasts were hosted by Xauxa leaders at Hatunmarca as well, and the UMARP excavations simply did not recover evidence of them. This could be due to sampling issues, and perhaps feasting activities simply took place in elite patio groups not selected for excavation, or in the central plaza, which also was not sampled. It could also be due to taphonomic issues, either at the time of deposition or in the years that followed. Perhaps feasts were held in the patio groups excavated, but in the process of preparing and cooking the food, large enough amounts of materials were not charred, or the waste was not burned after it was disposed of, and no macrobotanical evidence of these activities remain. Finally, post-

depositional preservation could be to blame. Unlike at Tunanmarca and Umpamalca, where the hilltop settlements were abandoned, wall collapse preserved many remains in the structures, and the sites were not farmed subsequently, continued occupation at Hatunmarca after Wanka II and more recent farming have made for much poorer preservation. Even if pre-Inka feasts were held, and a telling botanical signature was created, post-depositional occupation and farming may have obscured this.

On the other hand, it is possible that the differences in botanical patterning point to social and political differences between the northern and southern areas during Wanka II. These may be related to the different fates of the settlements under Inka rule. The Xauxa elite of the northern alliance, who actively negotiated their social and political positions through their command of labor and material goods to put on large feasts for the general populace, perhaps had more to lose than the elite households of the southern area, who perhaps were able to leverage their cooperation with the Inka into positions of continued status and power as local administrators of their reduced settlements.

The botanical record at Hatunmarca shows marked change over time. In keeping with Hastorf and Johannessen's (1993) findings for the region, the post-Inka occupations are much more closely associated with maize, as well as other crops. In fact, it is the Wanka IV contexts that have the closest association with food-related remains. The leveling effect that was found for the region is not apparent at Hatunmarca, however. If anything, the botanical assemblages of commoner and elite contexts become more different from each other with the Inka conquest.

## **Marca**

Marca was established under Inka rule in Wanka III on a settlement that had been occupied during Wanka I and subsequently abandoned to move upslope. On the eastern side of the Yanamarca Valley, set directly above the Inka road into the main Mantaro Valley and closest to the Inka regional capital of Hatun Xauxa, we may expect Marca to show the most direct effects of Inka rule. The overall composition of the botanical assemblage at Marca resembles that of the other sites, but patterns of deposition differ in some interesting ways.

### By Patio Group

Correspondence analysis of botanical remains by patio group at Marca show that most domestic compounds are fairly similar in their botanical assemblages, although two Wanka IV patio groups (54=6 and 54=1) appear to be slightly more dominated by food debris. (Figure 5.27). Commoner Wanka III patio group 54=2 stands apart from the other compounds and the general cluster of botanical material, distinguished by legumes, large grasses, wild legumes, and other fuel. Hastorf's (1991) contextual analysis of botanical remains in this patio group found that, although there was actually more maize present in this patio group than in elite Wanka II patio group 7=2 at Tunanmarca, the deposition of maize was much more restricted, perhaps indicating that under Inka rule, as women's labor to produce goods such as *chicha* for the state escalated, their activities were increasingly circumscribed.

### By ASD Type

Analyzing the botanical remains by architectural subdivision type indicates that the whole site may be characterized by a more restricted deposition of many crop and food-related remains (Figure 5.28). Structures and patios are distinct from each other, with structures strongly associated with maize kernels and embryos, tubers, colonial crops, and other food, as well as small grasses and dung. Patios are more closely associated with *quinoa* and *Scirpus*, and legumes appear to be fairly evenly distributed. Unlike at Hatunmarca, where all maize parts were found in both structures and patios, at Marca there is a clear spatial distinction between the edible parts and the inedible by-products. Maize cupules and cobs are strongly associated with patios, while kernels and embryos are found inside structures. This suggests a fairly strict division between maize storage and processing activities and maize preparation and cooking.

### By Phase

A correspondence analysis by phase shows the most clear distinction between food and non-food related botanical remains (Figure 5.29). As suggested by the patio group analysis, it is the colonial Wanka IV phase that is characterized by food-related remains. Although the relative difference between these two phases is not readily apparent on the regional scale (Figure 5.4), the site-level analysis makes the distinction clear. Wanka IV is strongly associated with almost all of the domesticated crops—maize kernels and embryos, legumes, tubers, other food, and of course colonial crops—as well as both wood and dung. *Scirpus*, on the other hand, is strongly associated with Wanka III. *Quinoa* plots directly between the two phases, suggesting that its importance remained constant from Inka to Spanish colonial times.

This patterning suggests an increased access to or use of food-related crop plants in the domestic sphere after the Inka were defeated and under Spanish administration. It perhaps emphasizes the extent to which the Inka exerted control over valuable goods and labor during their administration. Although the overall production of maize and other crops may have increased from Wanka II, no excavated Wanka III contexts show evidence of the sort of feasting activities argued to have taken place before Inka rule. This is presumably because Inka state taxes and the *mit'a* labor system controlled the products and provided a venue for their consumption outside of the Xauxa domestic sphere. With the Spanish conquest and the disruption of the Inka state control, however, we see a return of these food-related crop plants into the domestic compounds. This trend is echoed at Hatunmarca, where Wanka IV contexts also show an increased association with several food-related crop plants, and especially maize (Figure 5.24). Documentary evidence indicates that the Xauxa continued to maintain the *qollqa*, or Inka state storehouses, for two decades after the Spanish conquest, continuing to stock them, but also drawing from them until they were depleted in 1554 (D'Altroy and Hastorf 1984:339). It appears that even under Inka rule the provisioning of the *qollqa* was supervised by local leadership, so that the system could continue to function without the Inka state; this also implies that such networks existed prior to the Inka conquest as well (Hastorf, personal communication). With the contents of the *qollqa* no longer required for state-sponsored labor parties, local households may have benefited more from the redistribution. The fact that this trend is more pronounced at Marca than at Hatunmarca may be a result of its proximity to the Inka state center of Hatun Xauxa and the *qollqa* there.

## By Status-Phase

A correspondence analysis of botanical remains at Marca that takes both phase and status into account shows that elite and commoner households alike in Wanka IV had more food-related assemblages than their counterparts in Wanka III (Figure 5.30). Thus the leveling effect identified on a regional scale from Wanka II to Wanka III (Hastorf and Johannessen 1993) seems to continue into Wanka IV at Marca. If the increased association of Wanka IV patio groups with food-related plants was indeed due to increased access to the contents of the *qollqa*, it appears that the products may not have been used as they were during Wanka II at Tunanmarca and Umpamalca to bolster local leadership, but rather elites and commoner households alike benefitted from the redistribution. A state power structure remained after the Inka were defeated, even as expressions of state control may have changed under Spanish administration.

## **Summary of the Site-Level Analysis**

The preceding analysis of botanical remains recovered at each of the four sites points to what may be some interesting changes among households in conjunction with shifts in the political landscape over time. Two patio groups from the Wanka II sites Tunanmarca and Umpamalca have botanical assemblages that are outstanding for being strongly characterized by food-related remains. It is hypothesized that these assemblages reflect feasting activities that took place in these compounds, presumably hosted by the residents of these high-status households to reinforce their social and political positions in the community. Feasting in Wanka II thus represents an exercise or negotiation of power by local Xauxa leaders. It is curious that this food-related pattern is not evident at Wanka II Hatunmarca, and if this is not due to sampling or taphonomic issues, it may point to variability in social and political organization among the different Xauxa polities before the Inka conquest.

The hypothesized feasting signature so evident in Wanka II is not at all evident in Wanka III contexts at either Hatunmarca or Marca, even though access to food-related crop plants increased and ethnohistoric documents describe feasts put on by the Inka. It seems that as power shifted from the local to the state level, so did the responsibility for feasting. The Xauxa residents of Hatunmarca and Marca may have produced maize and other crops for the Inka and invested their labor to prepare them, especially adding value to maize through the work required to make *chicha*, but they did not use these products and labor to bolster their own social and political capital. Instead it was the Inka who may have hosted feasts, presumably for their *corvée* labor work parties, outside of the domestic spaces of local households. Stable isotope data from human skeletons from the two phases support this scenario. While the amount of maize in everyone's diet increased under Inka rule, men appear to have consumed a great deal more maize than women in Wanka III, likely in the form of *chicha* (Hastorf 1991; Hastorf and Johannessen 1993). Thus as power shifted from the local to the state level, and feasts likewise moved out of the household, the participants in feasts became men who formed the *corvée* labor work parties rather than women who labored for the Inka state in the home.

With the defeat of the Inka and the imposition of Spanish colonial rule, the botanical assemblages of Hatunmarca and Marca in fact become more food-related. It is unlikely, however, that this reflects the return of feasts to the household level and renewed negotiations of local power. Unlike the Wanka II contexts, in which the food-related assemblages of two elite households starkly contrast with the botanical remains of other compounds, especially at Marca

we see increased use of food-related plants in all households. It seems that the Xauxa of Wanka IV may have had more access to the goods formerly produced for the Inka state, but these products were not used to establish local power structures as they had been in the Wanka II autonomous polities to the north.

Overall, the paleoethnobotanical analysis shows a strong consistency in the botanical assemblage across sites and even across domestic compounds, but a good deal of variability in the patterns of deposition at different sites over space and time. The site-level analysis emphasizes the findings from the regional analysis that there is more similarity within sites over time than between sites during each phase. The picture painted by the botanical remains corresponds well with Sikkink's (2001) ethnographic findings that many activities tend to be done in many locations within the house, and households do not appear to conform to a strictly shared sense of the proper place for things to be done. Instead there are no clear patterns that link specific activities to specific spatial contexts that hold across sites or often even across patio groups within each site. Spatial patterning does exist within some sites, though, especially when open patios and enclosed structures are compared, and within domestic compounds. The following section examines the deposition of botanical remains within elite Wanka II patio group 7=2 for a more focused understanding of how food and non-food related botanical remains may have been used and discarded within a household.

## **CONTEXTUAL ANALYSIS OF BOTANICAL REMAINS AT 7=2**

This study argues that the unusually food-related nature of the botanical assemblage of elite patio group 7=2 at Tunanmarca reflects evidence of feasts that were prepared for and held at the domestic compound. To get a better idea of the spatial patterning of plant remains within the compound, statistical summaries of the botanicals were plotted as pie charts across the floor plans (Figures 5.31 and 5.32).

Patio group 7=2 consists of six circular structures arranged around a large open patio. The structures are numbered counterclockwise starting from the southwest corner of the compound. The patio space was divided into eight architectural subdivisions. All of the structures open onto the patio, and the compound is bounded by the structures and connecting walls to the north, east, and south. Two structures not belonging to the patio group form part of its western edge. The entrance to the patio group is between Structures 4 and 5 on the northern side, defined by large dressed limestone blocks. A short wall marks off a space in the northeastern corner of the patio, possibly used for storage. A total of four hearths were found inside Structures 2, 3 and 6, two ash pits in Structure 3, and three primary burials in Structures 1 and 4. Dense midden deposits were found along the walls in the northern, western, and southern edges of the patio. Excavations revealed a single occupation for the patio group.

Figure 5.31 shows the distribution of food-related versus non-food related botanical remains across the patio group. A pie chart for each provenience sampled is plotted. Since the compound was found to have had a single occupation, all levels that related to the occupation of the patio group were combined. The pie charts show the percentages of food-related versus non-food related botanical remains recovered at each provenience, and size of each pie chart is proportional to the density of botanical remains in the sample. Proveniences that were sampled but yielded no botanical remains are represented by a small circle with a dashed outline.

The diagram shows that the most dense botanical deposits by far are inside of the structures, although the patio space between Structures 5 and 6 and, to a lesser extent, Structure 1 also has dense deposits. These patio deposits may be tied to activities that took place inside the structures and immediately in front of them. It is interesting that most of the patio area with the highest density of botanical remains has no midden, and that the middens did not yield very dense botanical deposits. It is possible that samples taken from right up against the walls and corners would show dramatically different results (Hastorf, personal communication), but this may also indicate a different pattern of discard for plant remains from the ceramic, lithic, and bone artifacts that were used to define the middens. The possible storage area, marked off by the short wall in the northeast corner, has no midden and was found to have a low density of botanical materials, indicating that it was perhaps used for storing non-botanical goods such as textiles and tools, or for keeping animals.

Structures 2 and 6 have the highest density botanical deposits. The most dense sample, from the southeast corner of Structure 2, is due to a very large amount of *quinoa* found there. Samples from the hearths in Structure 6 were much more dense than hearth samples from Structure 3, possibly indicating more intense use, less scrupulous cleaning, more accidents resulting in spilling, or all three.

The proportion of food-related versus non-food related remains in each sample appears quite variable, although it is unusual for food-related remains to comprise more than half of the sample by count. The structure and patio areas along the northern and western sides of the compound that have the higher density of botanical remains also appear to have more samples with higher proportions of food-related remains. On the whole, this diagram presents a picture of particularly intense food preparation and cooking activities that may have taken place in the western sector of the compound. Structure 6, with its two hearths, may have been the central location and focus of all of the activity, which could have spilled out onto the patio in front of it and other structures around it. It is unlikely that the remains recovered from this area represent a single event, but are more likely to reflect a pattern of heavy use, either on a daily basis or repeatedly on special occasions. It is interesting that everything is located so close to the patio group's entrance. When visitors or members of the household passed through the doorway into the compound they may have seen directly in front of them and to their right an impressive bustle of food preparations and cooking. The less dense deposits to the left, in the eastern sector of the compound, may be due to less food-related preparations taking place in those areas, or perhaps increased foot traffic especially in the open patios due to greater mixed use of those areas obliterated more of the botanical remains. In either case, the area in and around Structure 6 appears to have been used especially heavily as a locus for food preparation, possibly for feasts that brought many people from outside the household into the compound to prepare and consume *chicha* and other special foods. Its situation right by the entrance may be for convenience as large amounts of people, goods, and equipment moved in and out of the compound, it may reflect a division of the domestic compound into more public and private areas, or it may have been an purposeful display of wealth and power that is part of the performance of a feast.

Figure 5.32 shows the distribution of different types of food-related plant remains across the patio group. As in the previous figure, all of the samples from a single provenience are combined into a single pie chart, but for clarity, the size of each pie is constant and not proportional to the density of the deposits. This diagram provides an interesting complement to the diagram showing food versus non-food distribution and botanical density. First, it is

immediately apparent that *quinoa* is the most ubiquitous food-related plant recovered, present in almost every provenience sampled in fairly high proportions. This is most likely due to two taphonomic factors discussed above: plants like *quinoa* with many tiny seeds will be disproportionately represented whenever counts are compared, and the tiny round seeds can easily roll around and scatter throughout the space wherever it is used. Maize kernels are much less ubiquitous, but they are present in several locations, sometimes comprising a large proportion of the sample. The samples most characterized by maize kernels are found not inside any structure, but in the patio area outside Structures 5 and 6, followed by the patio midden in the corner between Structures 1 and 2. Although the flotation samples from this midden were not dense, the screen data set also records a large deposit of maize kernels found in this midden. The structures with the largest proportion of maize are Structures 5 and 1. While the midden deposits outside of Structure 1 may represent refuse from activities that took place inside the structure, the patio deposits outside of Structure 5 may be the direct result of maize preparation that took place on the patio in front of the structures. A smaller number of maize embryos were also found in this patio area, as well as in Structure 1, lending support to the possibility that the maize prepared in these locations was used to make *chicha*.

Tubers are found to some extent throughout the compound, but they are best represented in the northern part of the patio group. More than half of several samples in Structure 6 are made up of tubers by count. A large portion of the one sample in the hypothesized storage area in the northeastern corner is also comprised of tubers, as well as *quinoa* and *Scirpus*. Legumes are most prevalent in the three eastern structures that account for most of the botanical remains in the compound, and they are also present in patio samples from the small corner midden just outside Structures 5 and 6, separate from the patio surface proveniences dominated by maize kernels. Legumes were also recovered in small numbers from Structure 2 and the hearth in Structure 3, as well as from not very dense deposits in the eastern area of the patio. *Scirpus* appears to some degree in every structure except Structure 5, as well as in several patio midden proveniences. The presence of *Scirpus* in the possible storage area may support its use as a material for a storage container rather than as a food item. Small amounts of wild and semi-cultivated taxa classified as “other food” were found in Structures 2, 3, 4 and 6, as well as in the corner midden between Structures 5 and 6.

The diagram reveals that the areas with the deposits shown to be the most dense and the most food-related in the previous figure also have the most diversity of food items in their deposits. Samples from the western sector of the compound—including the three structures and the patio space directly outside of them—have the most variegated pie charts. Rather than showing the dominance of one particular food item, such as maize, the botanical assemblage indicates that a variety of items were prepared in the areas of the most intense food preparation. If the highly food-related nature of the botanical assemblage of this compound does indeed reflect final feasts hosted by the household, and if the structures and patio areas with the most dense and food-related deposits are indeed the locations of cooking and preparations for the feasts, then the diversity of food items in these areas provides evidence for the variety of foods served as part of a Wanka II feast in addition to *chicha*.

## CHAPTER 5: TABLES

**Table 5.1** – The Botanical Taxa and Categories

Category	Food/ Non- food	Item	Latin binomial	Family	Common name
CHENO	Food	CHENOPODIUM	Chenopodium quinoa	Chenopodiaceae	Quinoa
COLONIAL CROP	Food	TRITICUM	Triticum sp.	Poaceae	Wheat
		PISUM (PEA)	Pisum sp.	Fabaceae	Pea
Dung	Non- food	LLAMA DUNG	--	--	Llama dung
		CUY DUNG	--	--	Guinea pig dung
		DUNG	--	--	
LEGUME	Food	LUPINUS	Lupinus mutabilis	Fabaceae	Tarhui
		DOMESTICATED LEGUMES	cf. Lupinus or Phaseolus	Fabaceae	
		PHASEOLUS	Phaseolus vulgaris	Fabaceae	
Parenchyma	Non- food	LUMPS (UNIDENTIFIABLE CHARRED PLANT TISSUE)	--	--	
OTHER FOOD	Food	AMARANTHUS	Amaranthus sp.		
		LEPIDIUM (SEEDS)	Lepidium meyenii	Brassicaceae	Maca
		LUCUMA	Lucuma obovata = Pouteria lucuma	Sapotaceae	Lucuma
		RUBUS	Rubus sp.	Rosaceae	
		PHYSALIS	Physalis sp.	Solanaceae	Inca berry, tomatillo
		OXALIS (SEED)	Oxalis sp.		Oca
		OPUNTIA	Opuntia sp.	Cactaceae	Prickly pear cactus
		LEPIDIUM CORM	Lepidium sp.	Brassicaceae	Maca
		CHENOPOD or AMARANTHUS	--	--	Quinoa or amaranth
		ECHINOCACTUS	Echinocactus sp.	Cactaceae	
Other fuel	Non- food	MEDIUM POACEAE	--	Poaceae	Grass
		TWIG	--	--	
		BRANCH	--	--	
		GRASS NODE	--	Poaceae	

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Table 5.1 continued

Category	Food/ Non- food	Item	Latin binomial	Family	Common name
PlantPart	Non- food	GRASS STALKS	--	Poaceae	Grass stalk
		PEDUNCLE	--	--	
		RIND	--	--	
		LEAF	--	--	
		HUSK	--	--	
		ZEA MAYS - STALK	Zea mays	Poaceae	Maize
		SPINE	--	--	
		BARK	--	--	
		TANTAL TWIG	Citharexylum sp.	Verbenaceae	Tantal
PoaLg	Non- food	LARGE POACEAE	--	Poaceae	Grass
PoaSm	Non- food	SMALL POACEAE	--	Poaceae	Grass
SCIRPUS	Food	SCIRPUS	Scirpus/ Schoenoplectus sp.	Cyperaceae	
TUBERS	Food	TUBERS	--	--	
		SOLANUM TUBERS	Solanum spp.	Solanaceae	Potato
		OXALIS TUBERS	Oxalis tuberosa	Oxalidaceae	Oca
		ULLUCUS TUBERS	Ullucus tuberosus	Basellaceae	Ullucu
		TROPAEOLUM TUBERS	Tropeaolum tuberosum	Tropeaoleaceae	Mashua
UnidSeeds	Non- food	UNIDENTIFIABLE SEEDS	--	--	
WildLeg	Non- food	WILD LEGUMES	--	Fabaceae	
WildSeed	Non- food	PORTULACA	Portulaca sp.	Portulacaceae	
		VERBENA	Verbena sp.	Verbenaceae	
		PLANTAGO	Plantago sp.		
		MALVACEAE	--	Malvaceae	
		AMBROSIA	Ambrosia peruviana	Asteraceae	
		NICOTIANA	Nicotiana sp.	Solanaceae	Tobacco
		SALVIA	Salvia sp.	Lamiaceae	Sage
		LABIATAE	--	Lamiaceae	Mint family
		CYPERACEAE	--	Cyperaceae	Sedge family
		COMPOSITAE	--	Asteraceae	Daisy family
		UMBELLIFERAE	--	Apiaceae	
		MOLLUGO			
		EUPHORBIACEAE	--	Euphorbiaceae	

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Table 5.1 continued

Category	Food/ Non- food	Item	Latin binomial	Family	Common name
WildSeed (cont)	Non- food	CRUCIFERAE	--	Brassicaceae	Mustard family
		GALIUM	Galium sp.	Rubiaceae	
		VITACEAE	--	Vitaceae	Grape family
		SOLANACEAE (SEED)	--	Solanaceae	
		SISYRINCHIUM	Sisyrinchium sp.	Iridaceae	Blue-eyed grass
		RELBUNIUUM	Relbunium sp.	Rubiaceae	
		CALENDRIA	Calandrinia sp.	Portulacaceae	Purslane
		CACTACEAE	--	Cactaceae	Cactus family
		POLYGONACEAE	--	Polygonaceae	
		ELEOCHARIS	Eleocharis sp.	Cyperaceae	
		BIXA	Bixa orellana	Bixaceae	Achiote
		CAREX	Carex sp.	Cyperaceae	
		ERYTHROXYLON (COCA)	Erythroxylon coca	Erythroxylaceae	Coca
Wood	Non- food	WOOD	--	--	
Zea cupules	Non- food	ZEA MAYS CUPULES/COB FRAGMENTS	Zea mays	Poaceae	Maize
ZEA EMBRYOS	Food	ZEA MAYS EMBRYOS	Zea mays	Poaceae	Maize
ZEA KERNELS	Food	ZEA MAYS KERNELS	Zea mays	Poaceae	Maize

**Table 5.2 – Cultural Contexts**

<b>Code</b>	<b>Category</b>	<b>Cultural Context</b>
0	Surface	Surface
1	Surface	Humus root zone (contaminated): do not combine analytically
2	Surface	Plowed
3	Surface	Fallow
4	Surface	Wild, natural surface
5	Surface	Plow zone
6	Surface	Excavated surface
7	Surface	Modern wall, rock pile
8	Surface	Humus root zone, okay to combine
9	Surface	Modern burned area
10	Wall	Wall, general
11	Wall	Rock wall, unmortared
12	Wall	Pirka wall
13	Wall	Dressed stone wall
14	Wall	Rock wall fall, unmortared
15	Wall	Pirka wall fall (contaminated): do not combine analytically
16	Wall	Dressed stone wall fall
17	Wall	Retaining wall fall
18	Wall	Pirka wallfall, combine
19	Wall	Possible wall
20	Midden	Low density midden
21	Midden	Medium density midden
22	Midden	High density midden
23	Midden	Low density midden with ash
24	Midden	Medium density midden with ash
25	Midden	High density midden with ash
26	Midden	Plow zone derived from midden
27	Midden	
28	Midden	Ceramic dump
29	Midden	Soil with artifacts
30	Cultural Surface	Cultural surface
31	Cultural Surface	Occupation zone
32	Cultural Surface	Activity area
33	Cultural Surface	Floor contact
34	Cultural Surface	Compact floor
35	Cultural Surface	Paved floor
36	Cultural Surface	Rock subfloor
37	Cultural Surface	Patio floor
38	Cultural Surface	Plow zone derived from occupation zone
39	Cultural Surface	Possible occupation zone
40	Feature	Feature
41	Pit	Pit
42	Hearth	Hearth

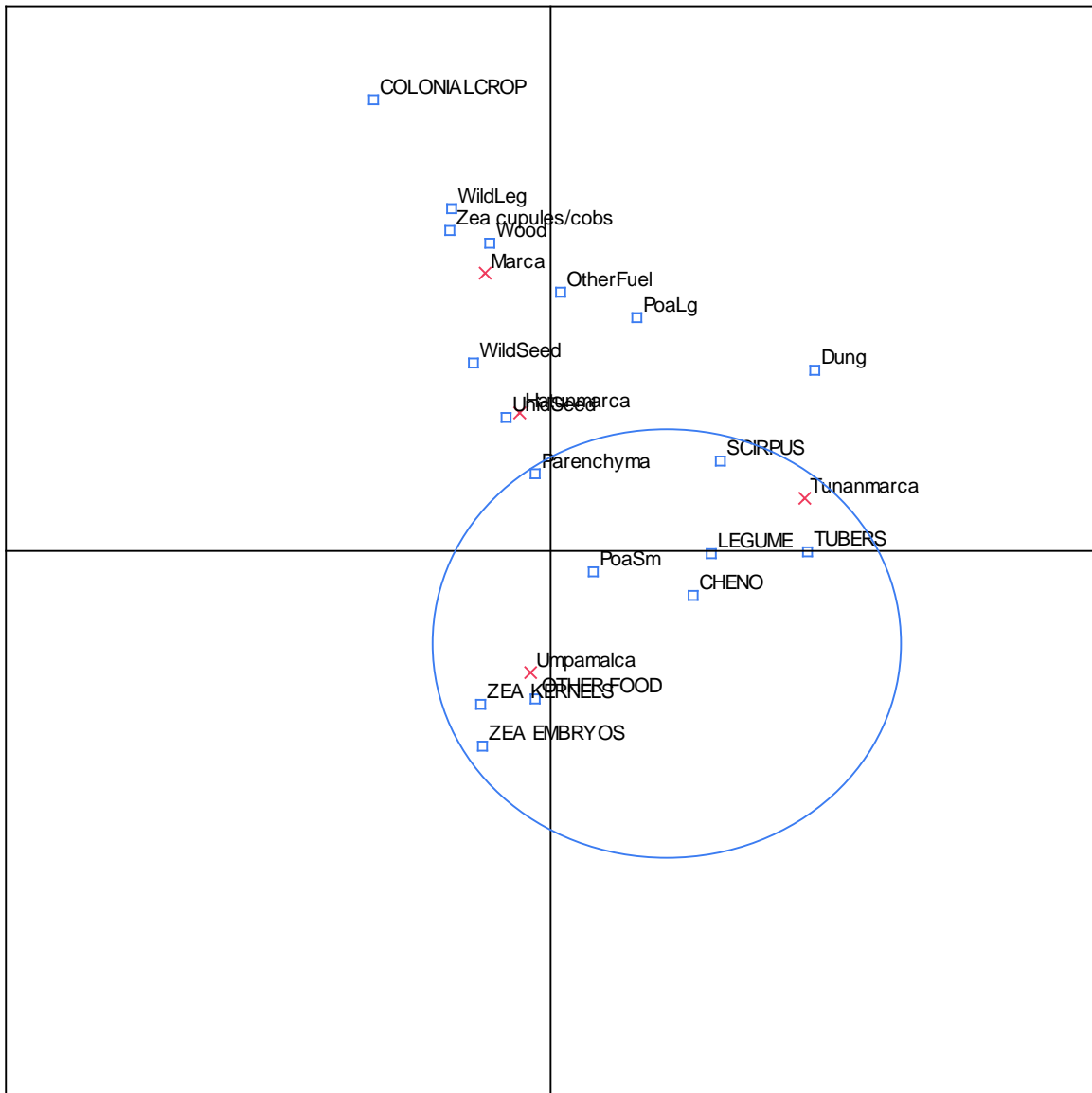
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Table 5.2 continued

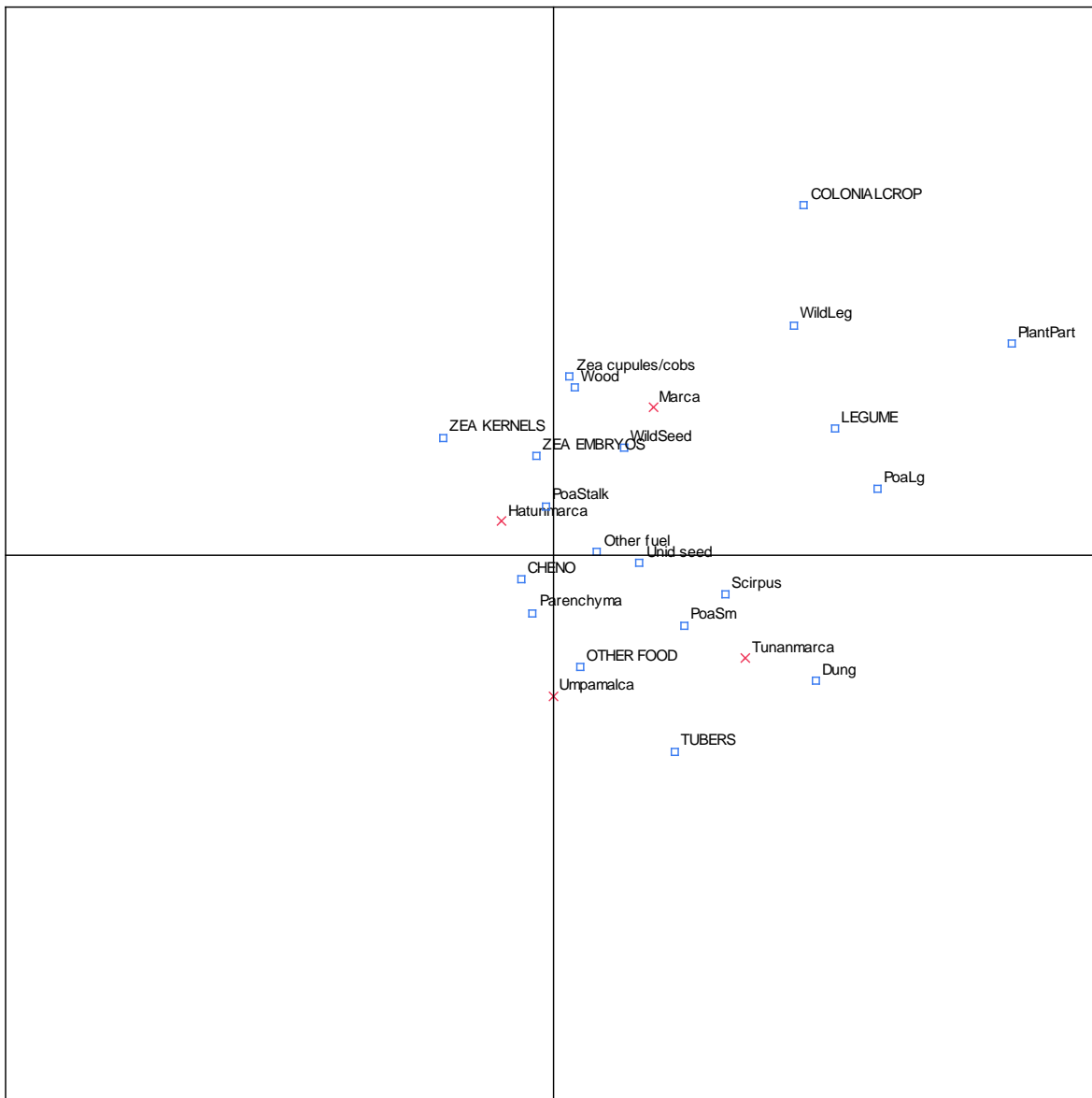
<b>Code</b>	<b>Category</b>	<b>Cultural Context</b>
43	Canal	Subfloor drainage canal
44	Stairway	Stairway
45	Kiln	Kiln or other firing feature
46	Ash	Ash lens or deposit
47	Post hole	Post hole
48	Feature	Disturbed feature
49	Feature	Possible feature
50	Burial	Primary subfloor
51	Burial	Secondary subfloor
52	Burial	Primary midden
53	Burial	Secondary midden
54	Burial	Primary patio
55	Burial	Secondary patio
56	Burial	Wall fall burial
57	Burial	
58	Burial	Offertory animal burial
59	Burial	Possible burial
60	Fill	Natural soil with artifacts
61	Fill	Midden used as fill
62	Fill	Cultural fill
63	Fill	
64	Fill	
65	Fill	Natural soil, sterile
66	Fill	
67	Fill	
68	Fill	
69	Fill	Possible fill
70	Pothole	Pothole
90	Undifferentiated	Undifferentiated soil
91	Undifferentiated	Undifferentiated rock

## CHAPTER 5: FIGURES

**Figure 5.1** – Regional analysis of botanical remains by site

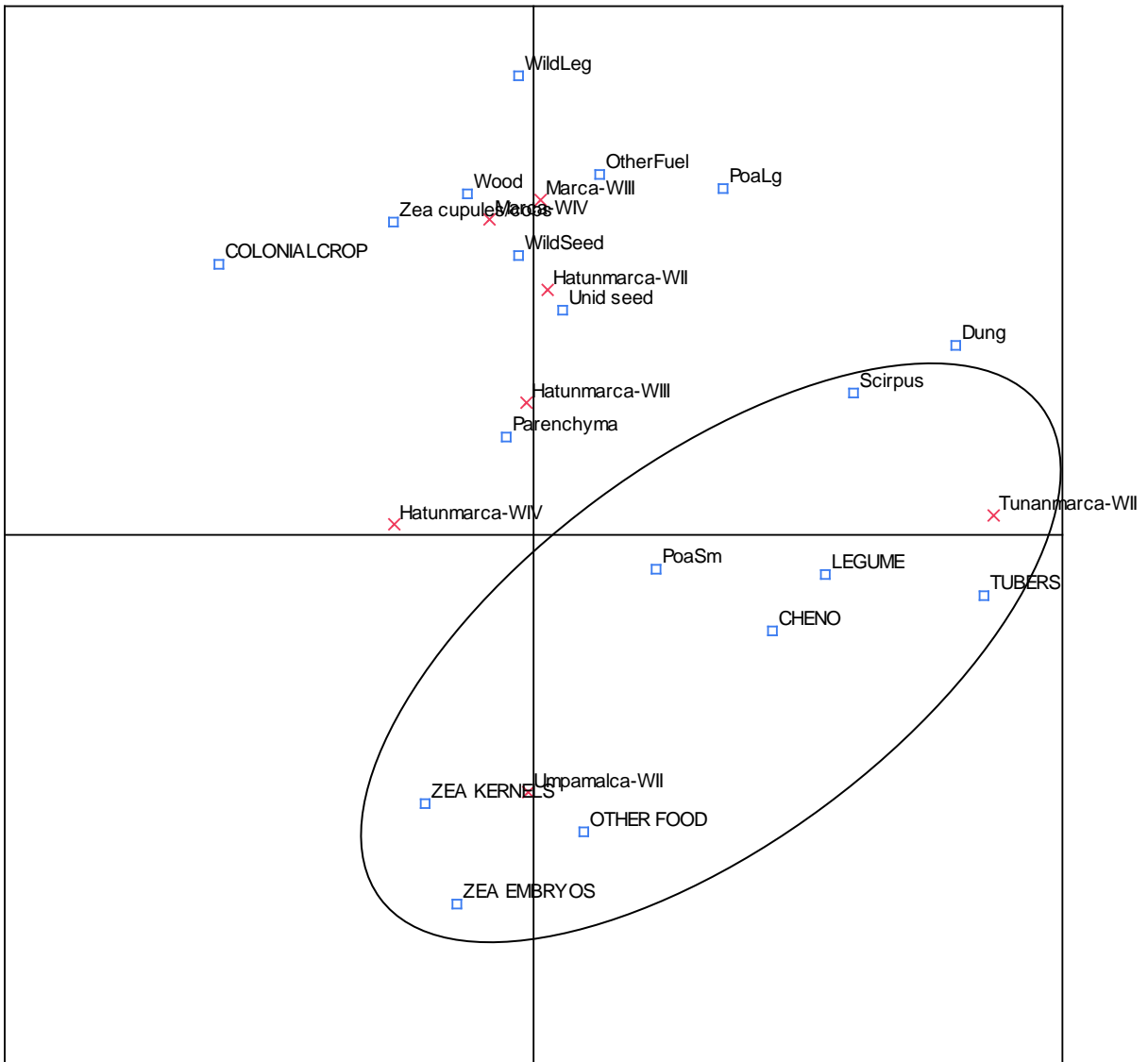


**Figure 5.2** – Regional analysis of botanical remains by site, excluding patio groups 7=2 and 41=1

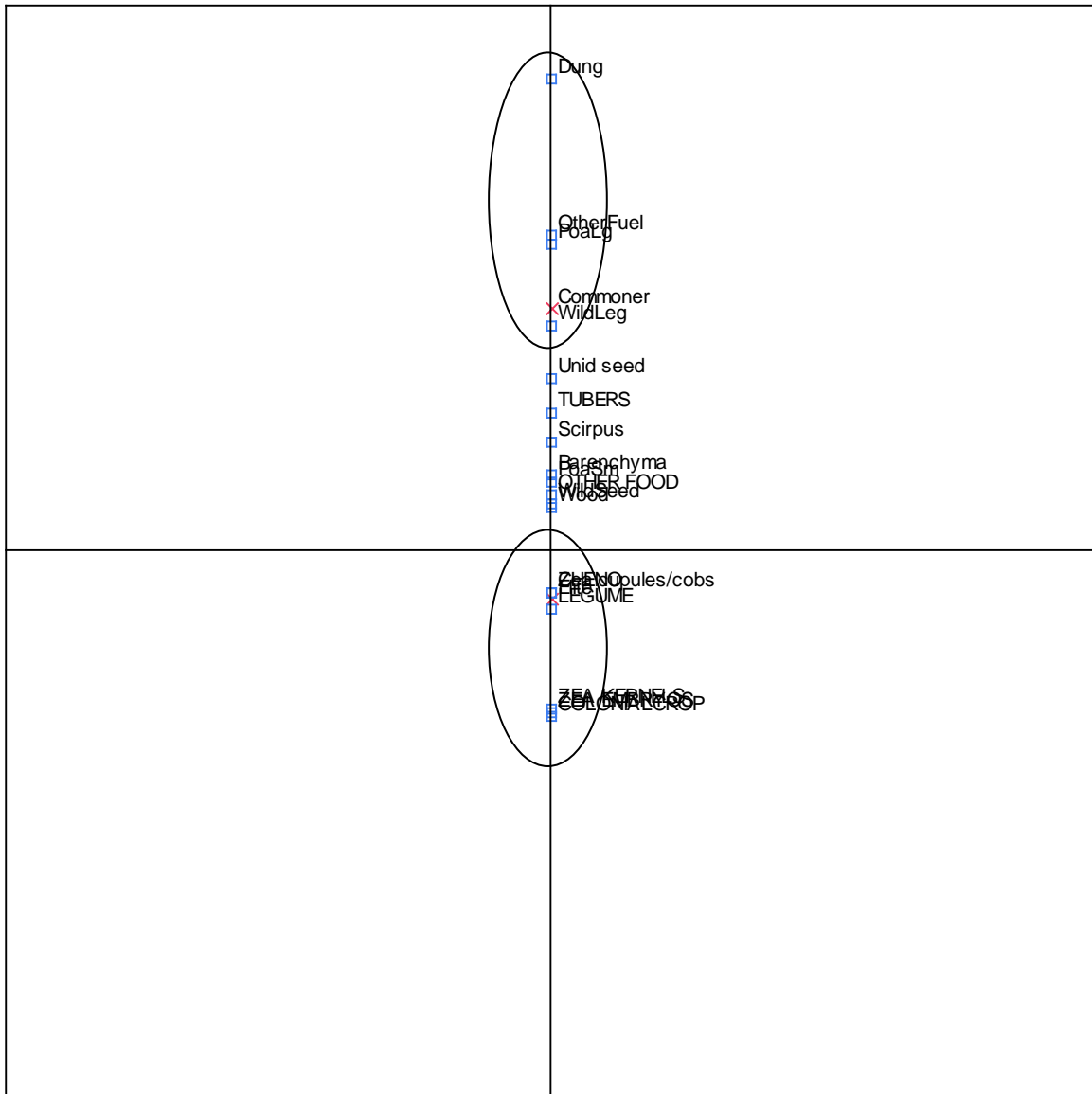




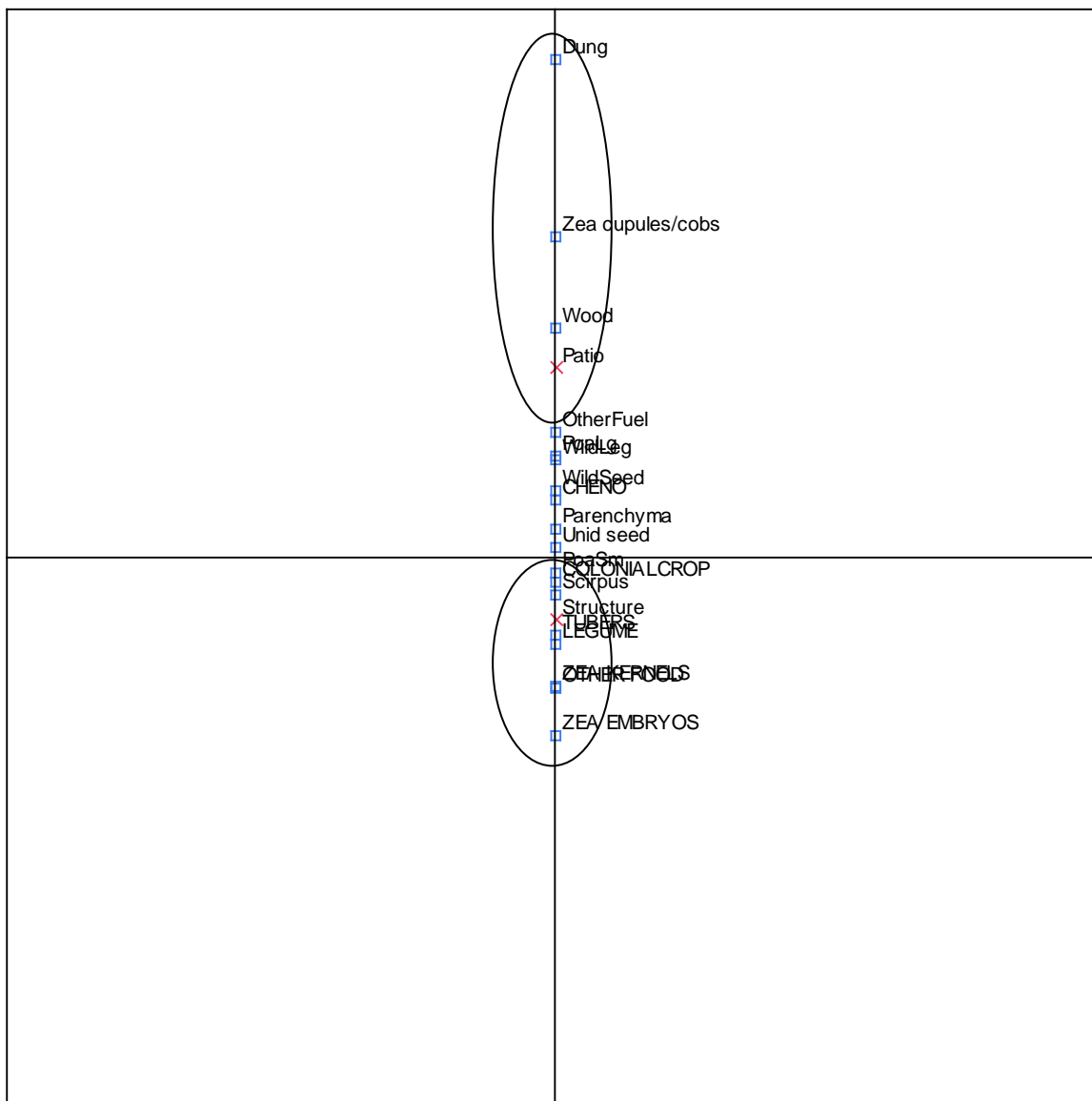
**Figure 5.4** – Regional analysis of botanical remains by site and phase



**Figure 5.5** – Regional analysis of botanical remains by status



**Figure 5.6** – Regional analysis of botanical remains by ASD type



**Figure 5.7** – Regional analysis of botanical remains by cultural context

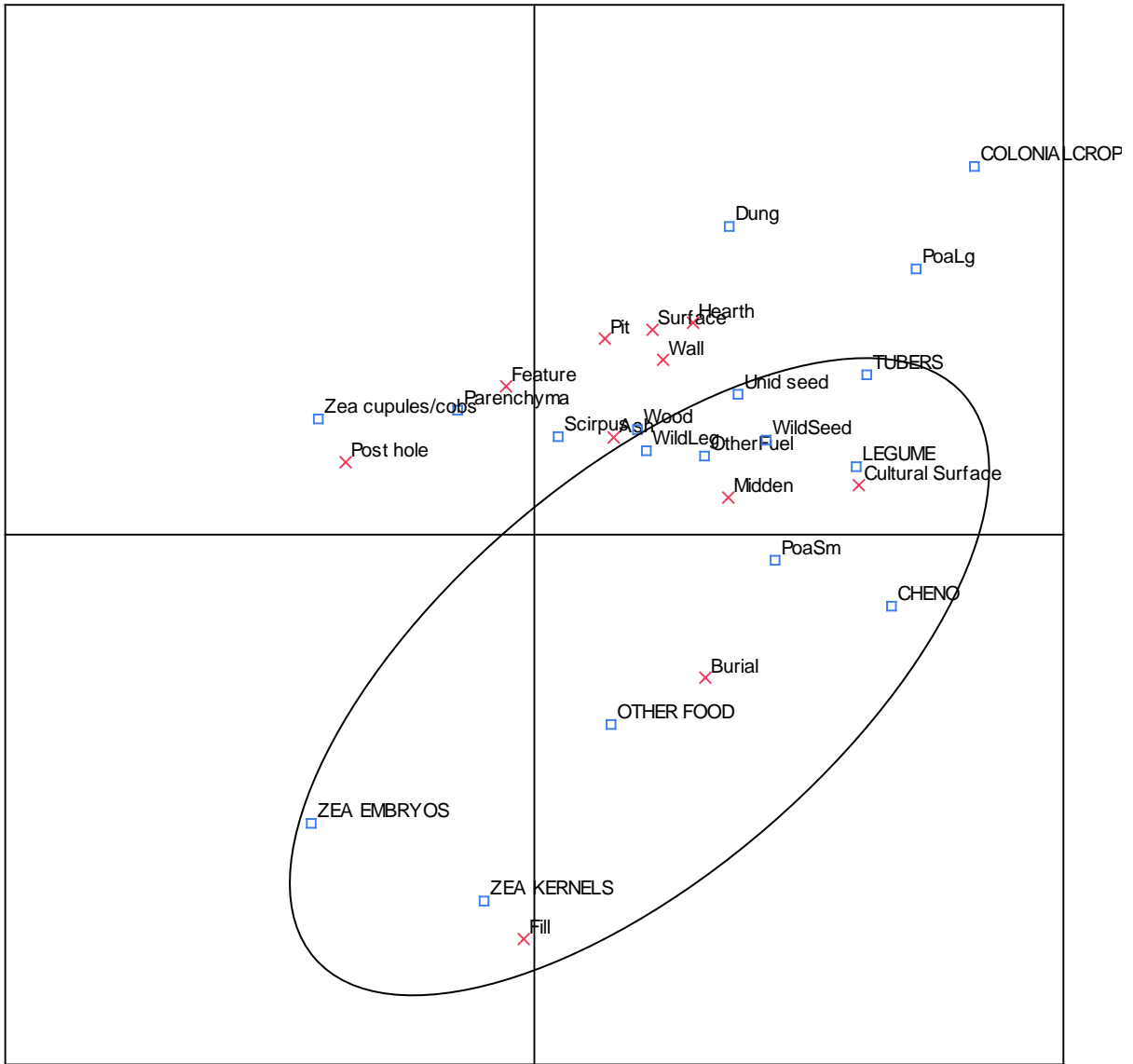
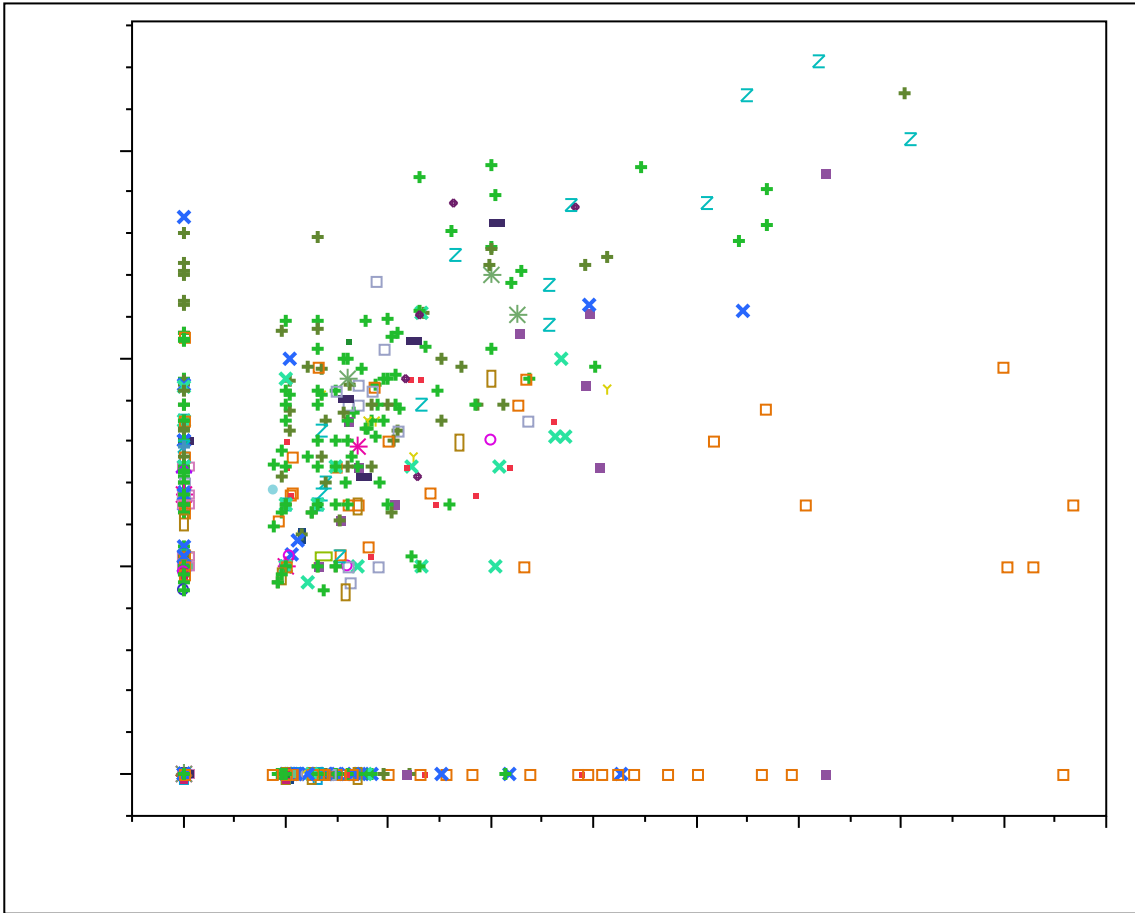
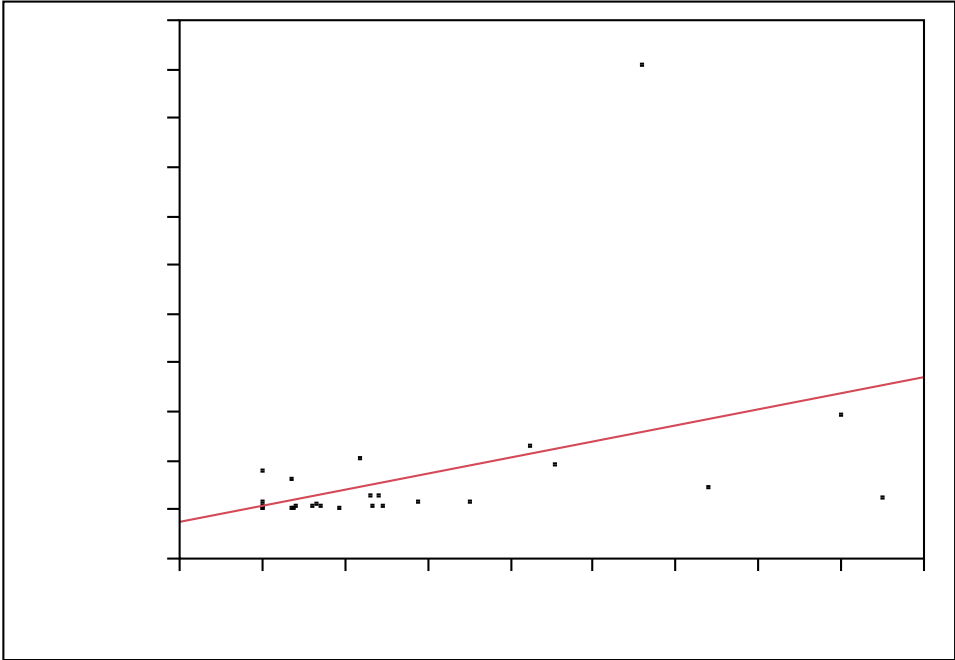


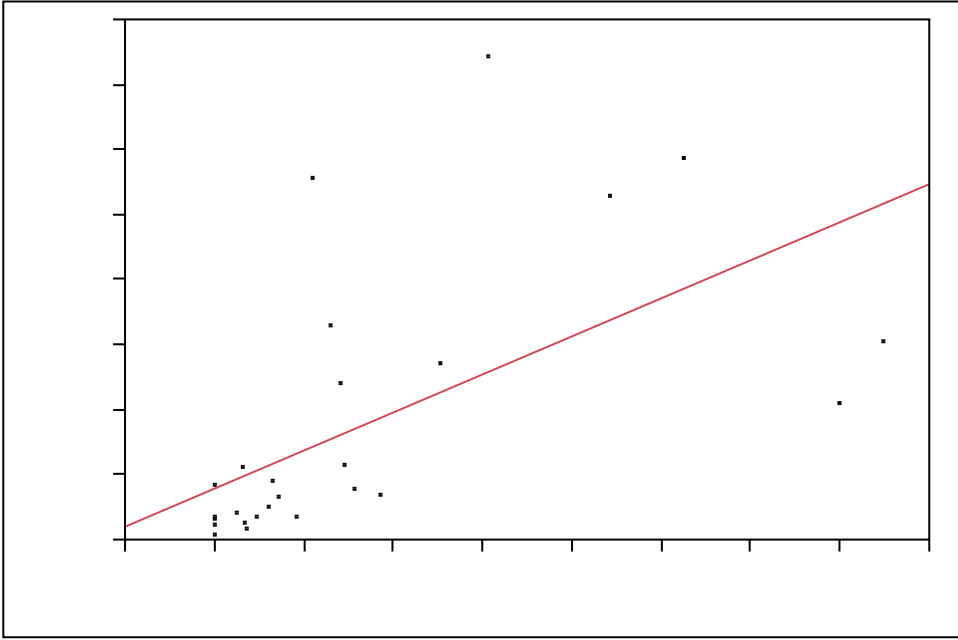
Figure 5.8 – Regression analysis of maize kernels and embryos versus cupules and cobs



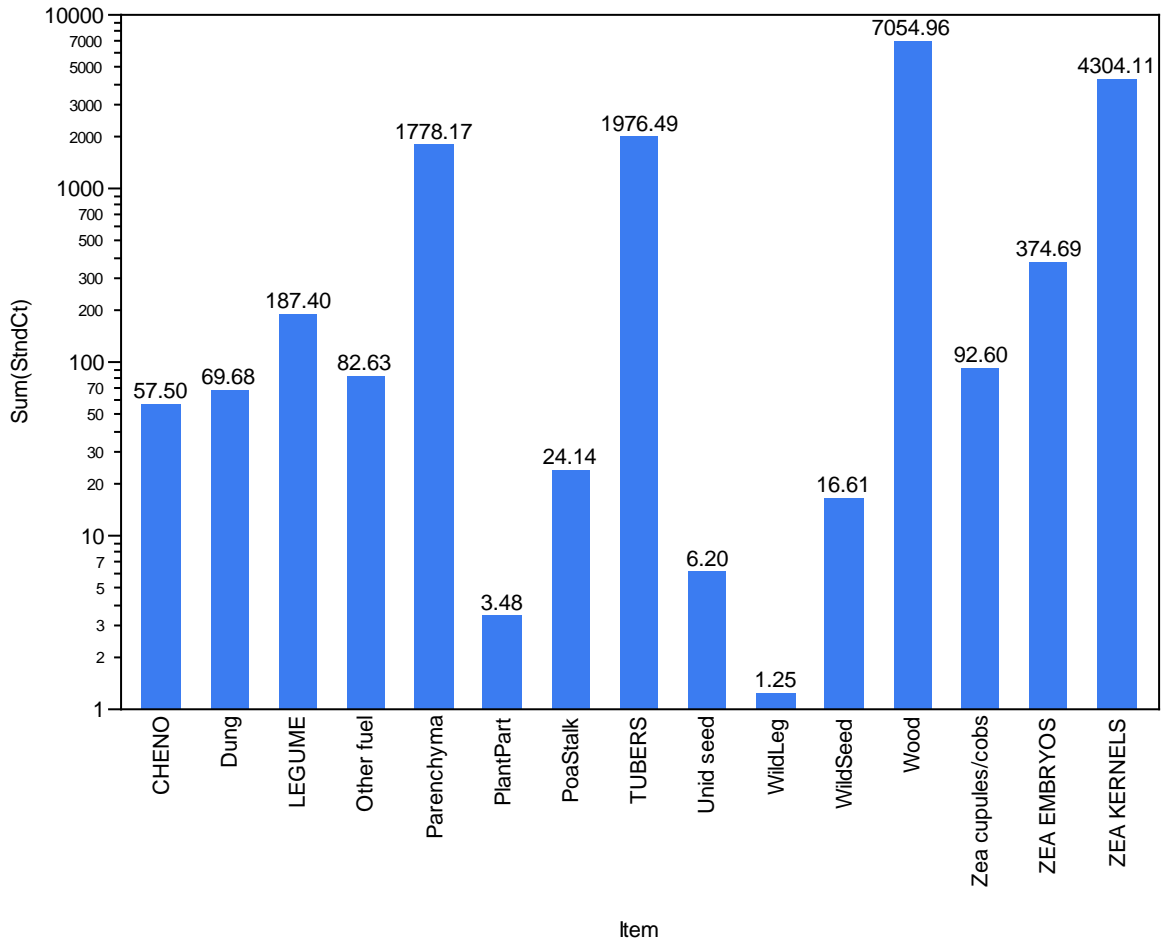
**Figure 5.9** – Regression analysis of *Scirpus* versus food-related remains



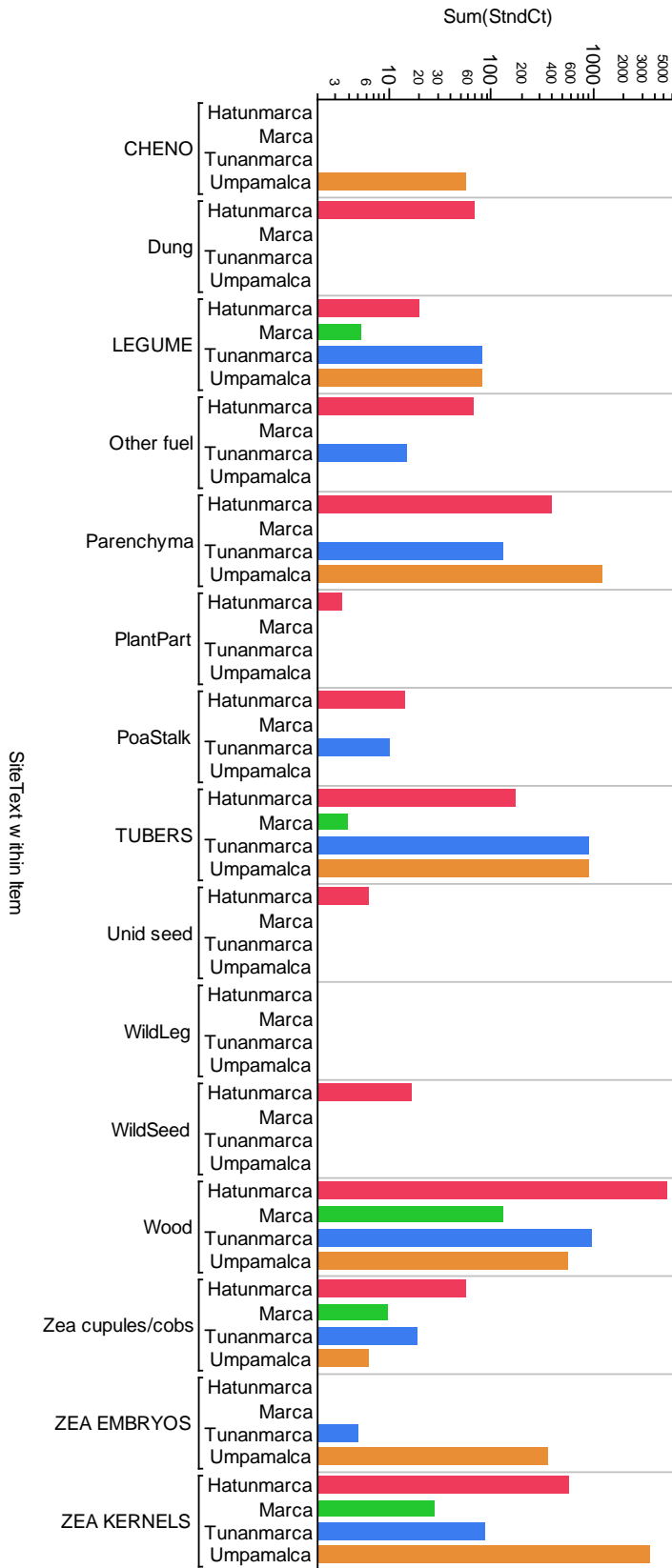
**Figure 5.10** – Regression analysis of *Scirpus* versus non food-related remains



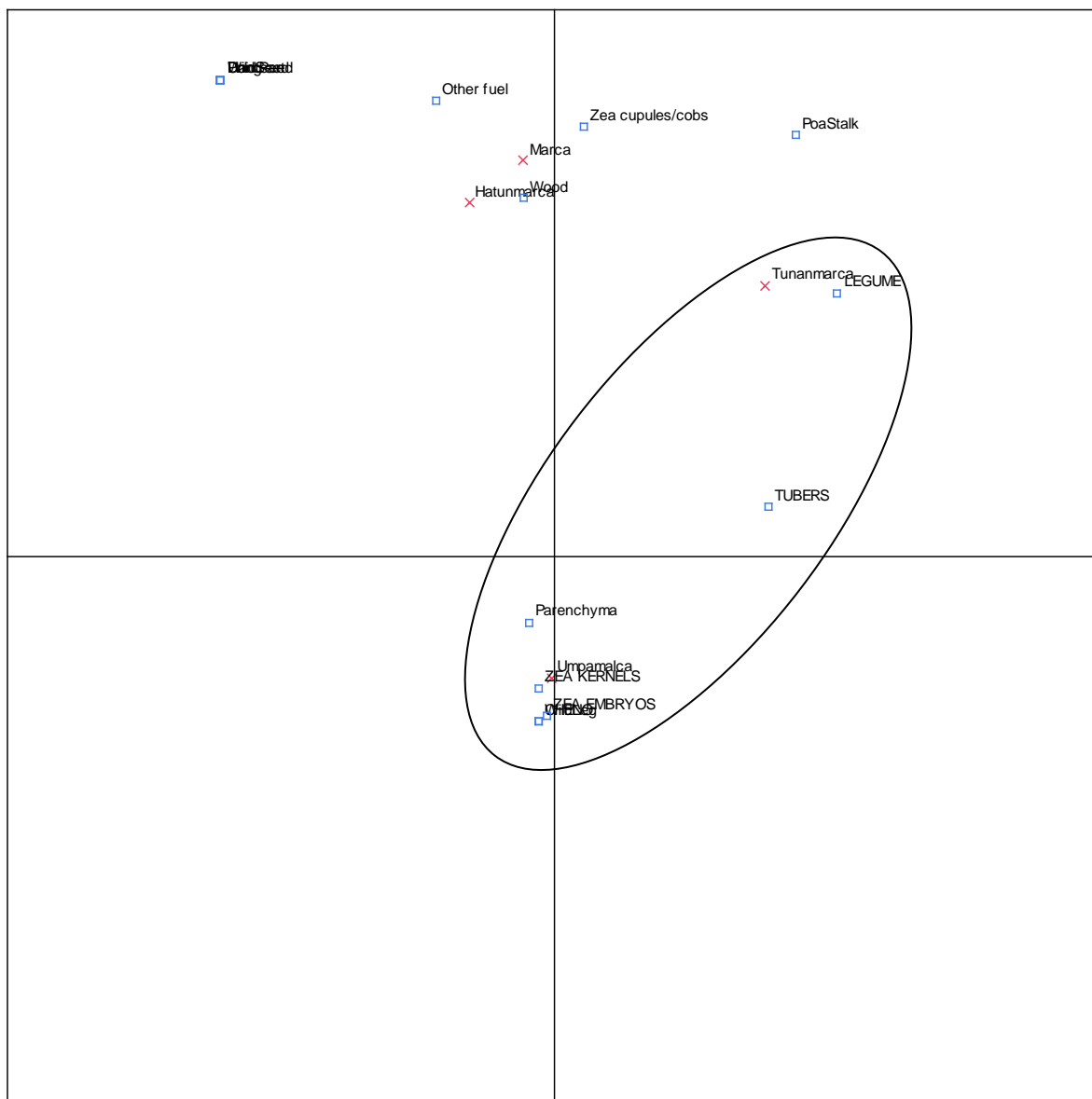
**Figure 5.11a** - Total density of each botanical category from the screen data set



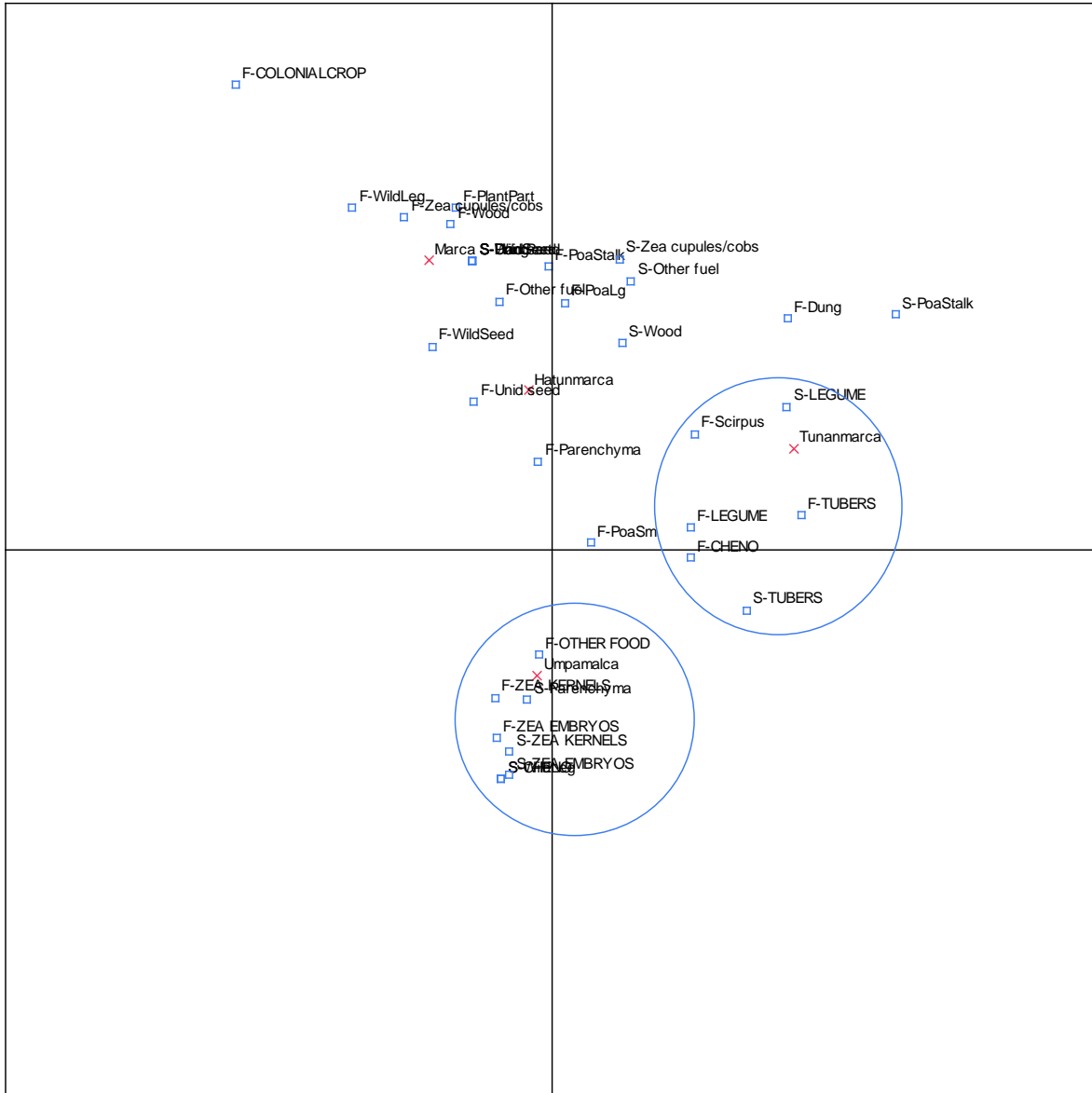
**Figure 5.11b** - Total density of each botanical category by site from the screen data set



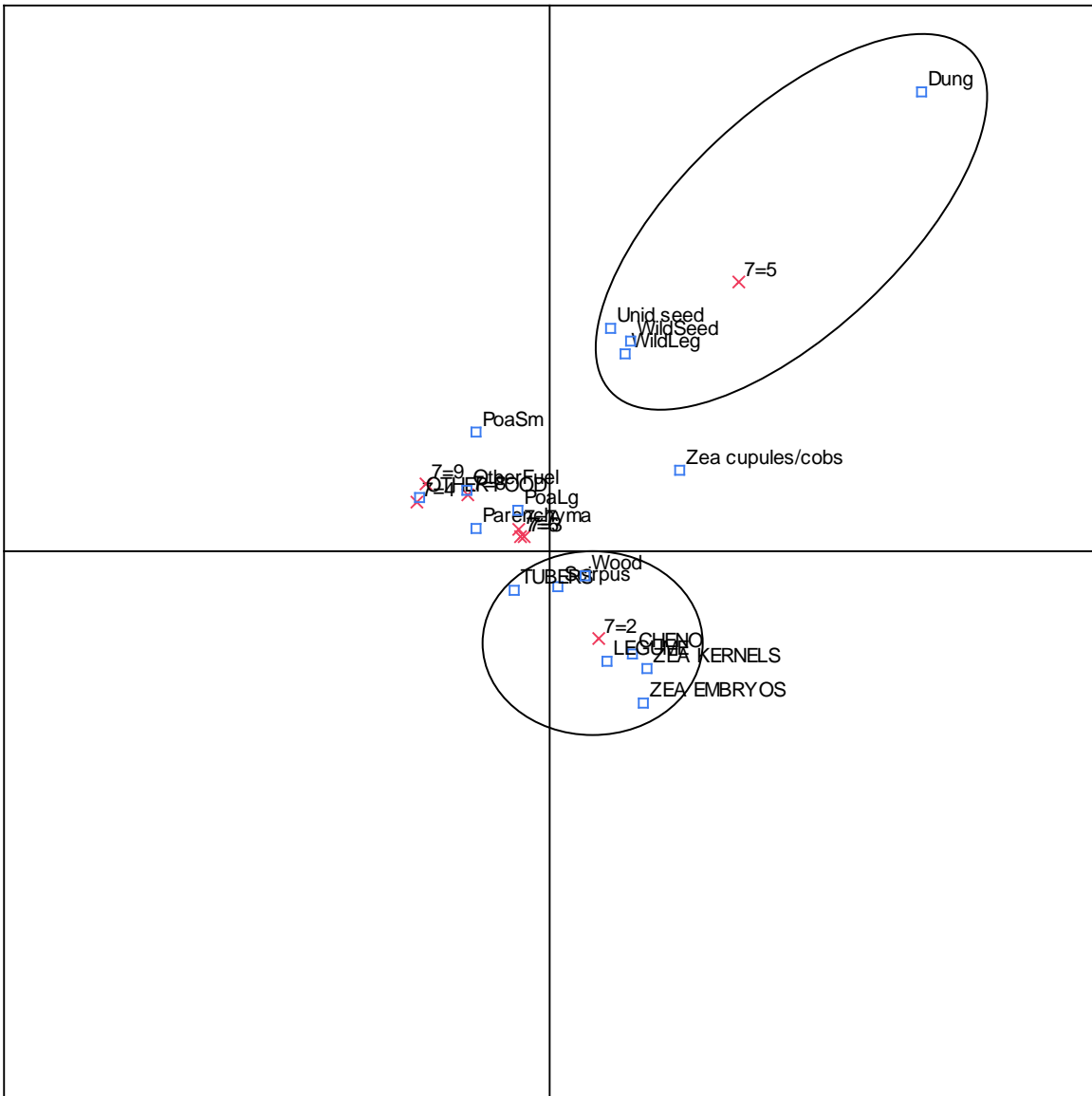
**Figure 5.12** – Regional analysis of botanical remains by site from the screen data set



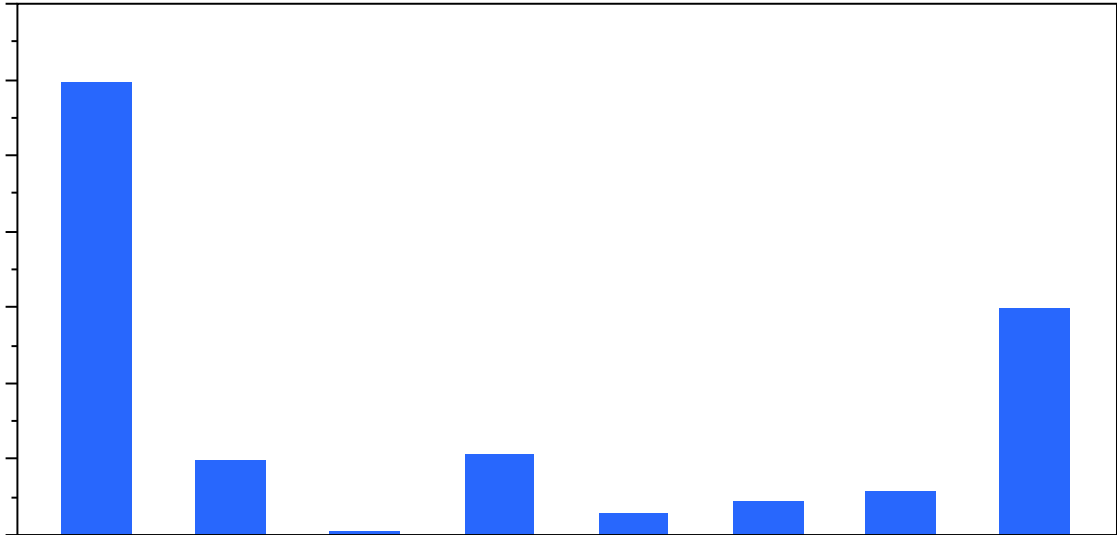
**Figure 5.13** – Regional analysis of botanical remains by site from both flotation and screen data sets



**Figure 5.14** – Analysis of botanical remains at Tunanmarca by patio group

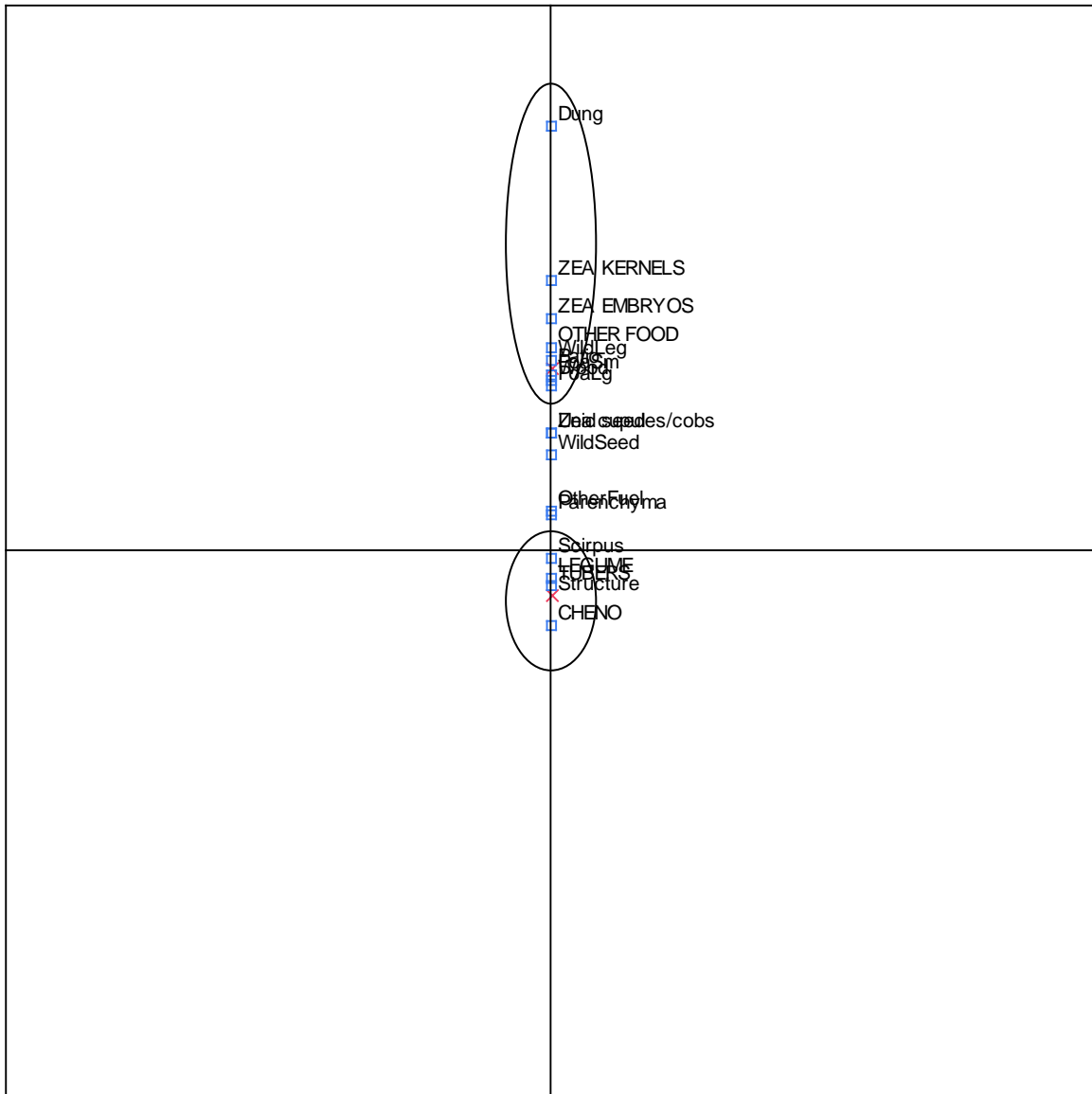


**Figure 5.15** – Densities of botanical remains recovered at Tunanmarca by patio group.  
Sum(StdCt) = Density = (total count / total flot volume) x 100

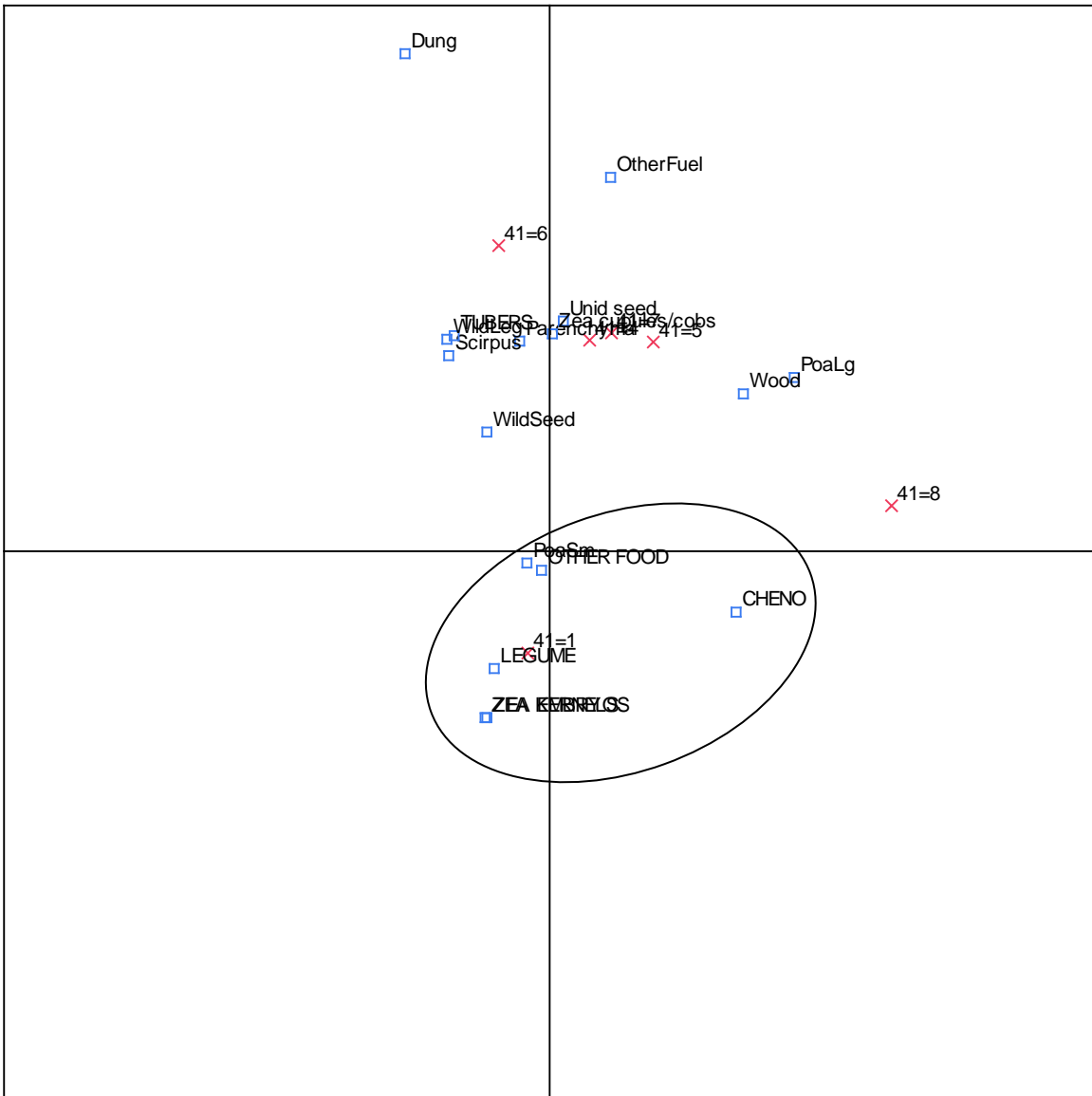




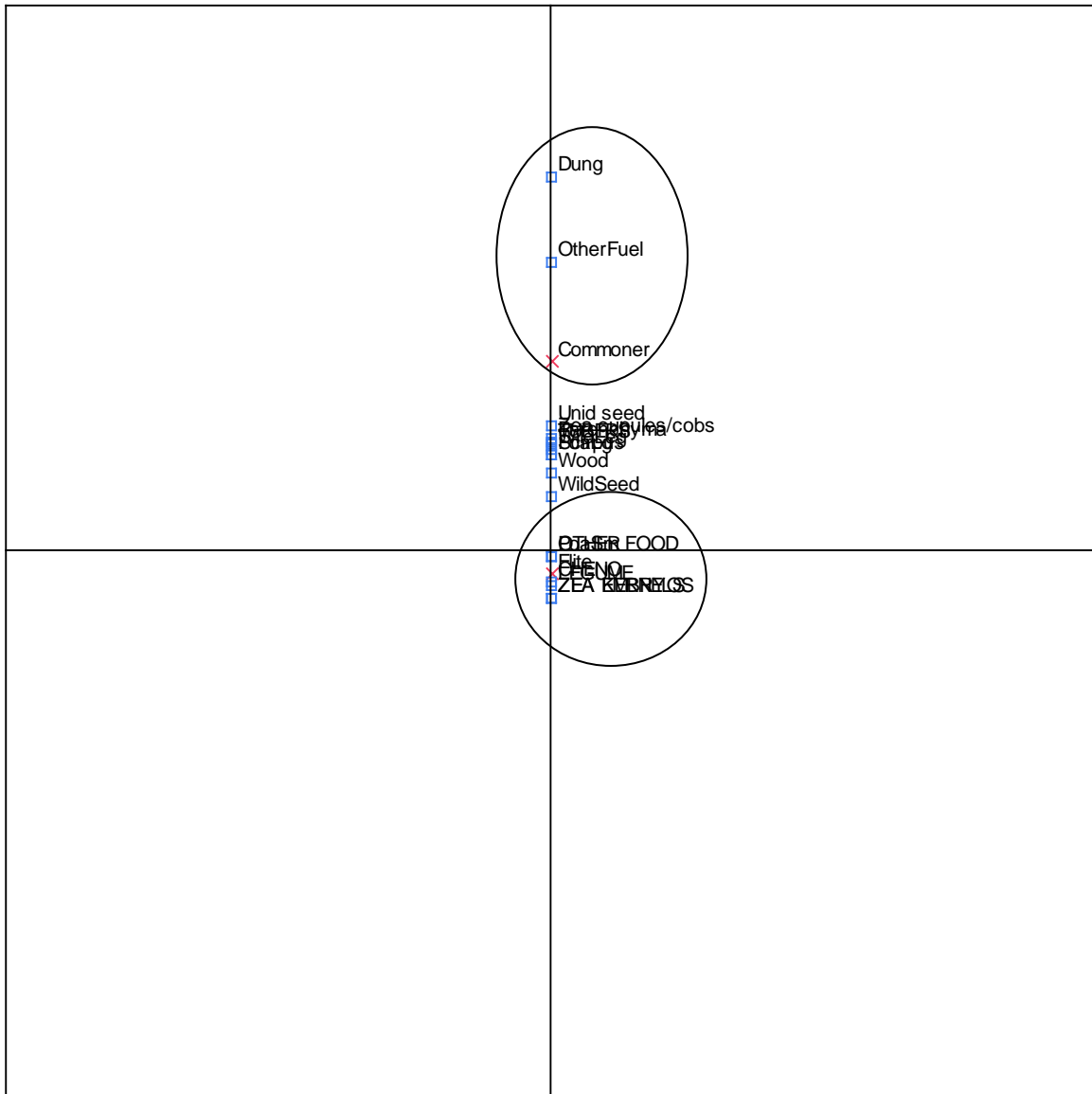
**Figure 5.17** – Analysis of botanical remains at Tunanmarca by ASD type



**Figure 5.18** – Analysis of botanical remains at Umpamalca by patio group

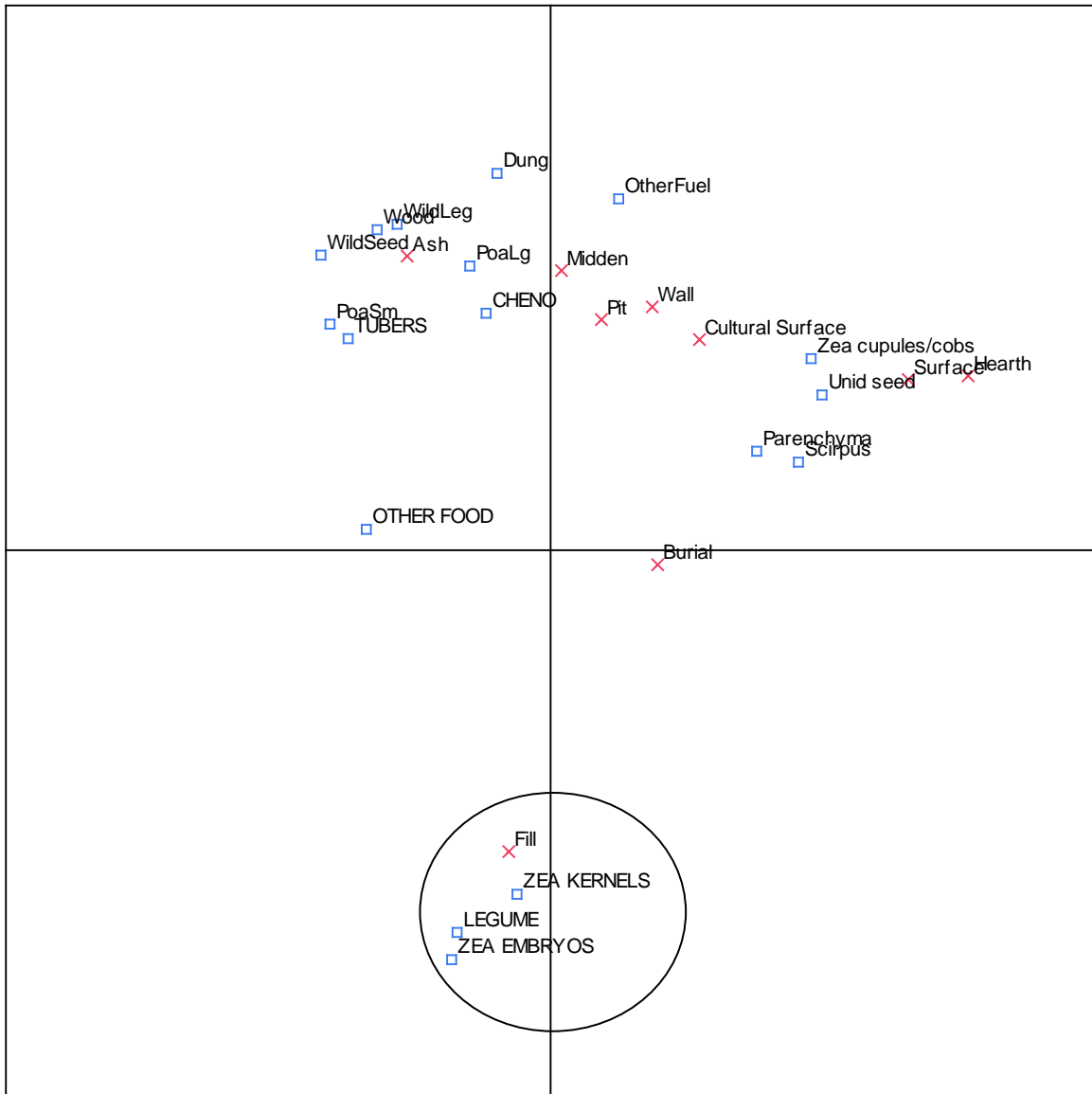


**Figure 5.19** – Analysis of botanical remains at Umpamalca by status

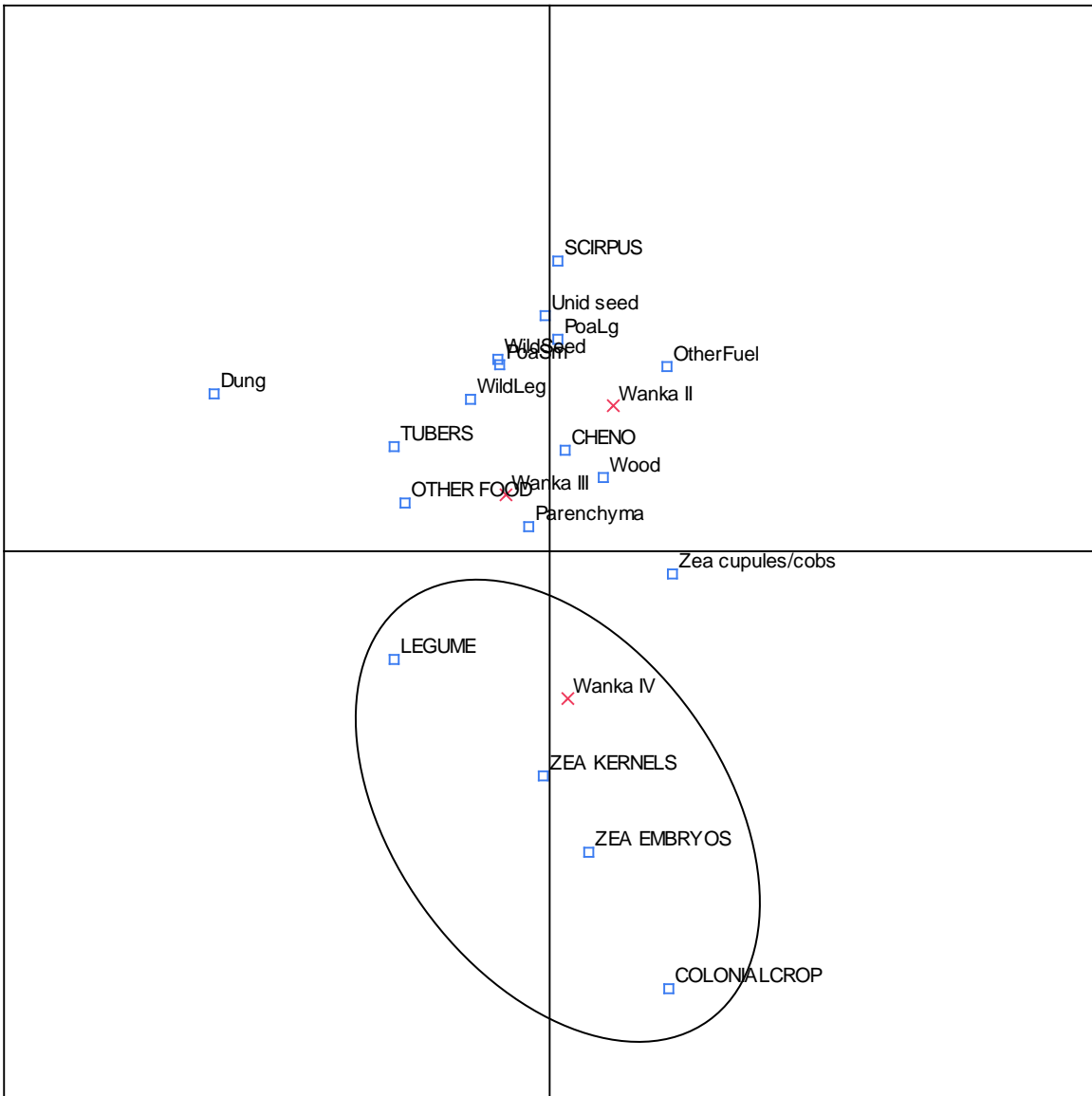




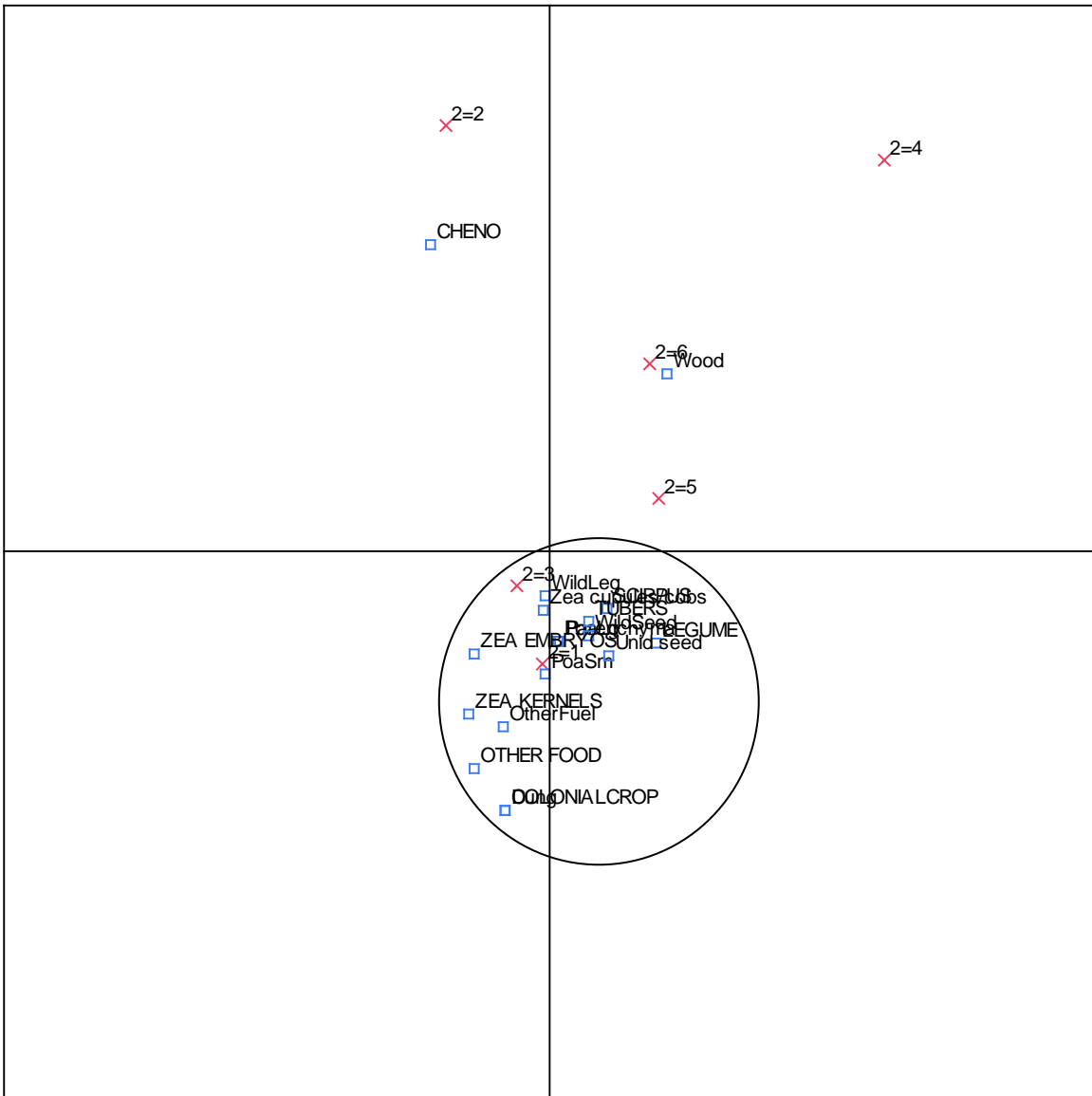
**Figure 5.21** – Analysis of botanical remains at Umpamalca by cultural context



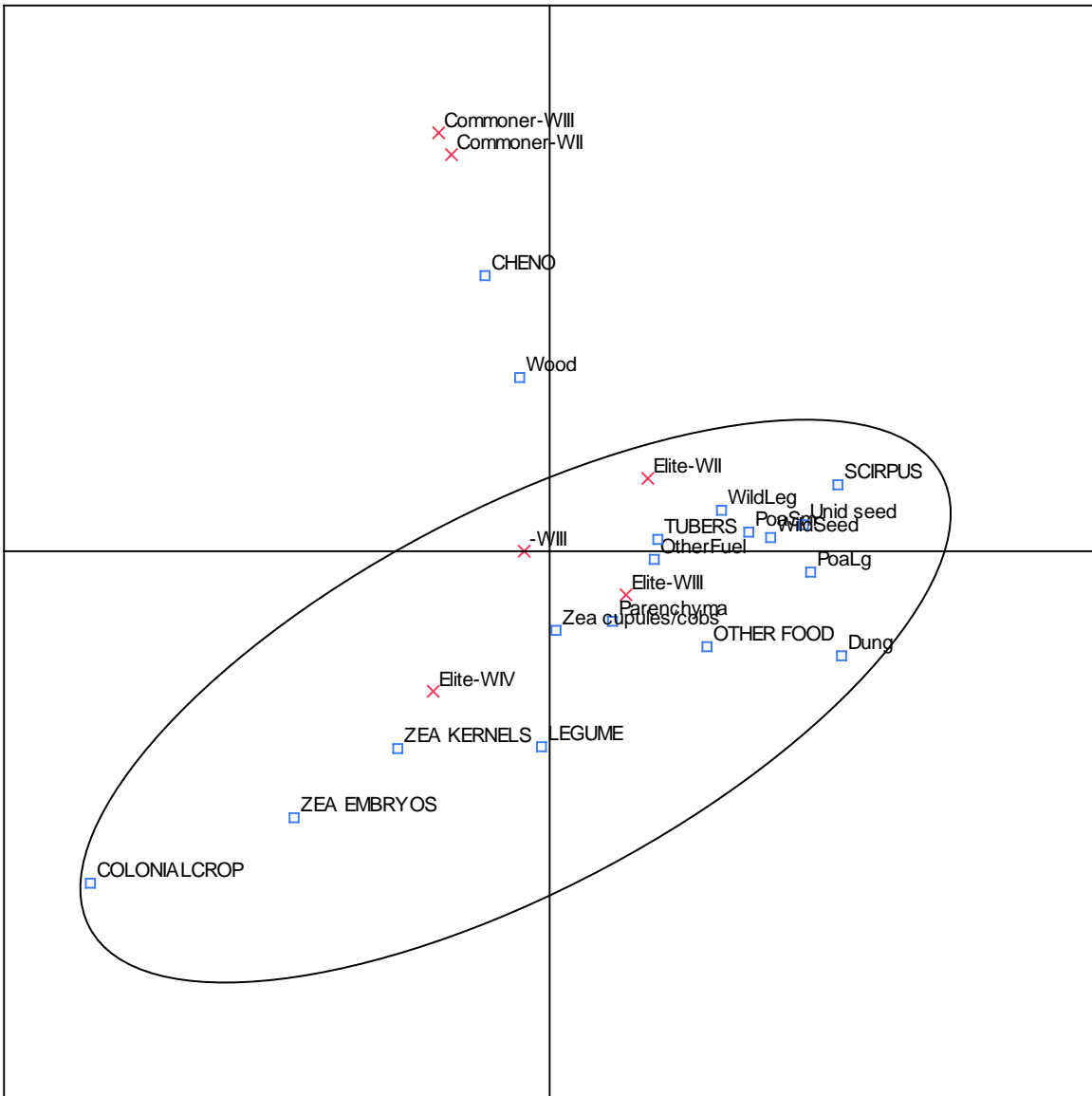
**Figure 5.22** – Analysis of botanical remains at Hatumarca by phase



**Figure 5.23** – Analysis of botanical remains at Hatunmarca by patio group

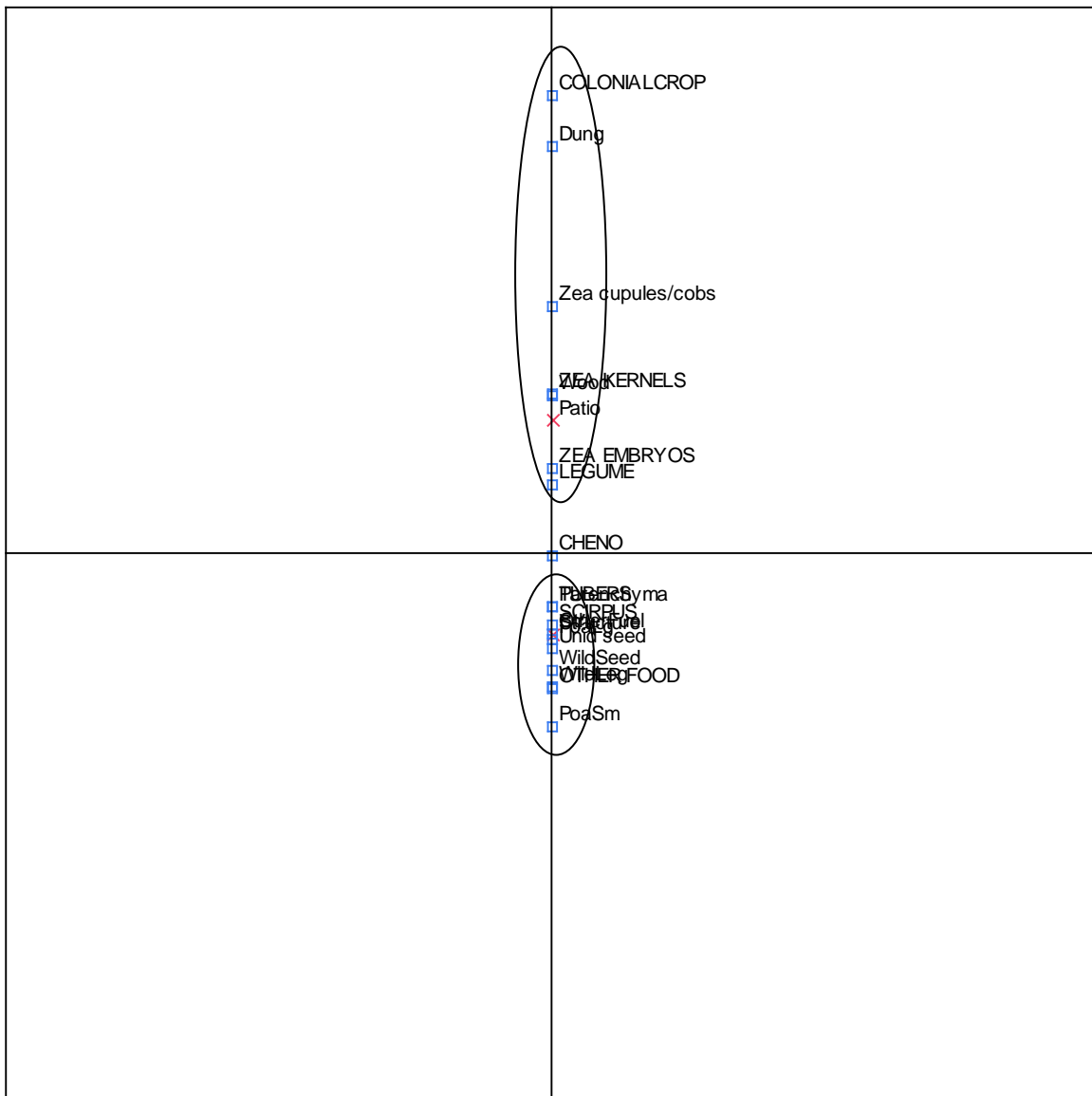


**Figure 5.24** – Analysis of botanical remains at Hatunmarca by status and phase

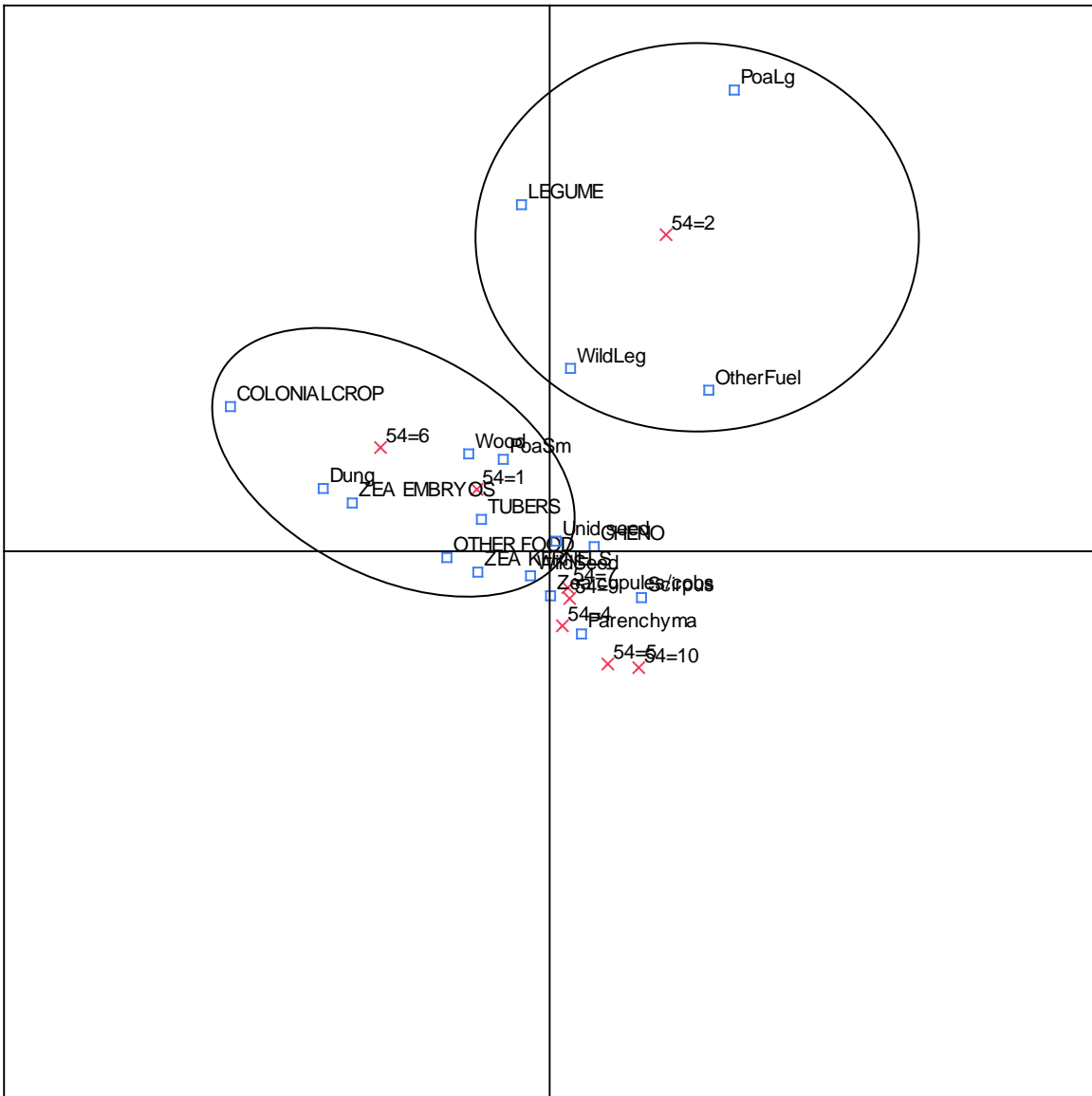




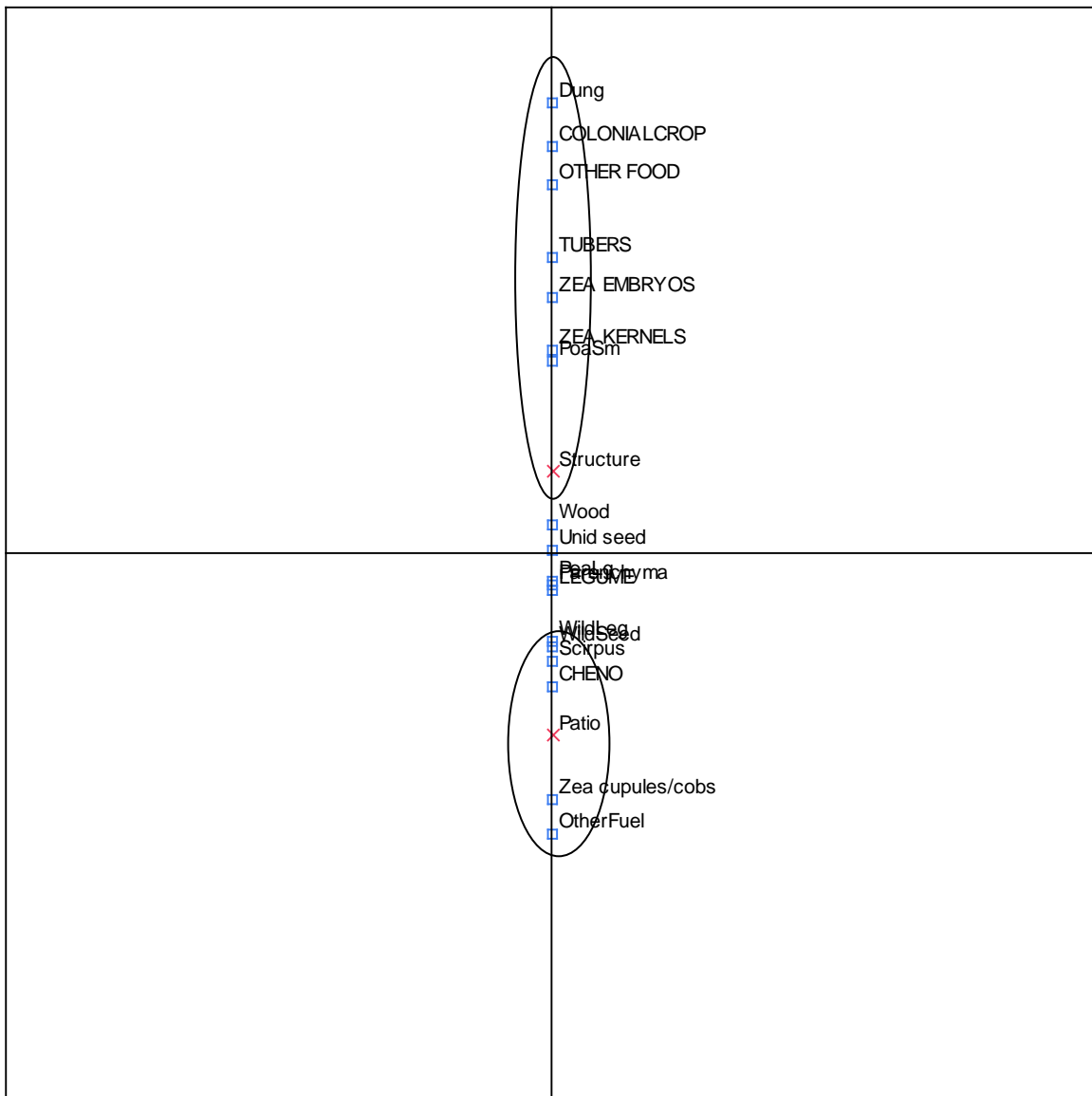
**Figure 5.26** – Analysis of botanical remains at Hatunmarca by ASD type



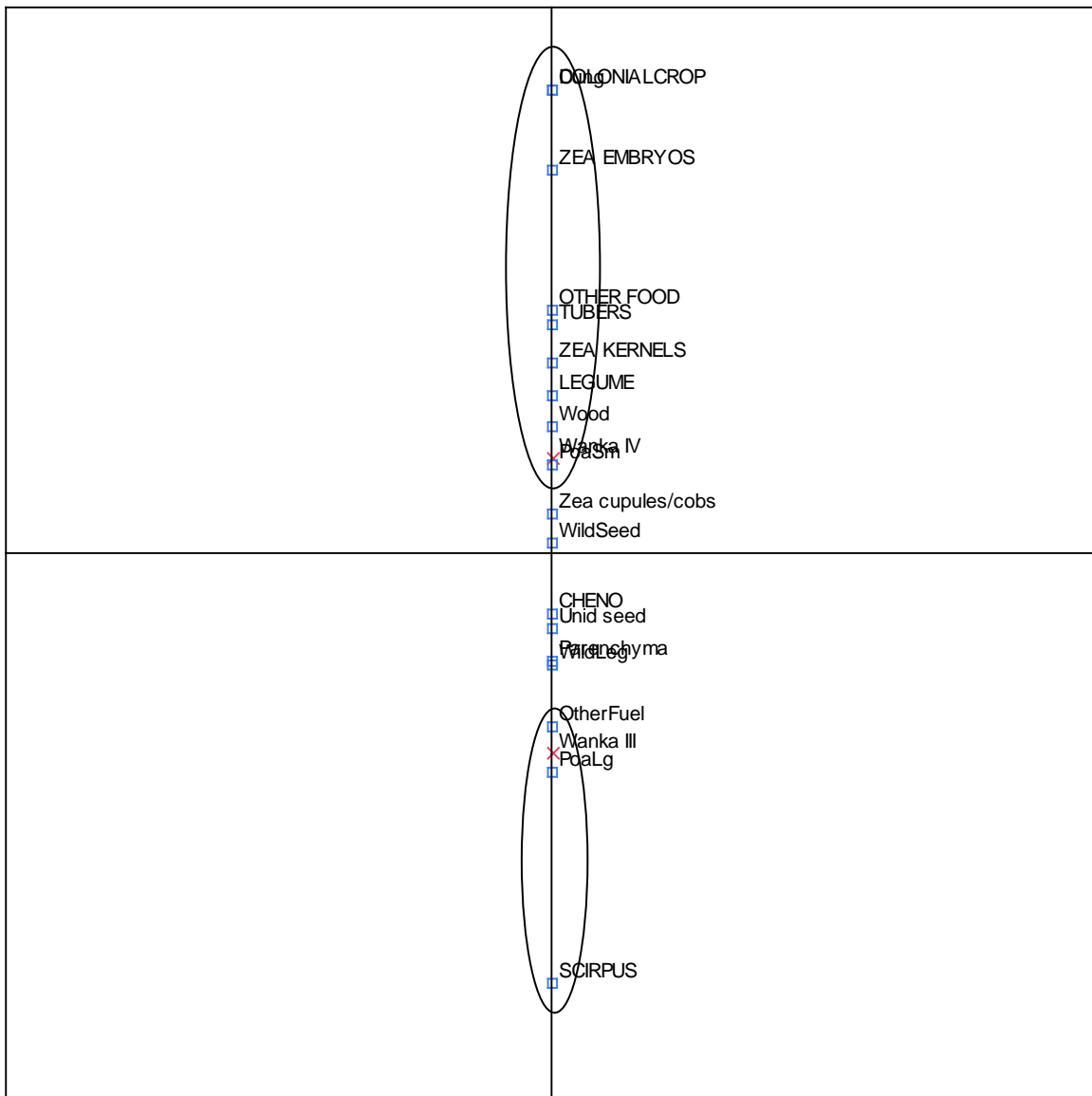
**Figure 5.27** – Analysis of botanical remains at Marca by patio group



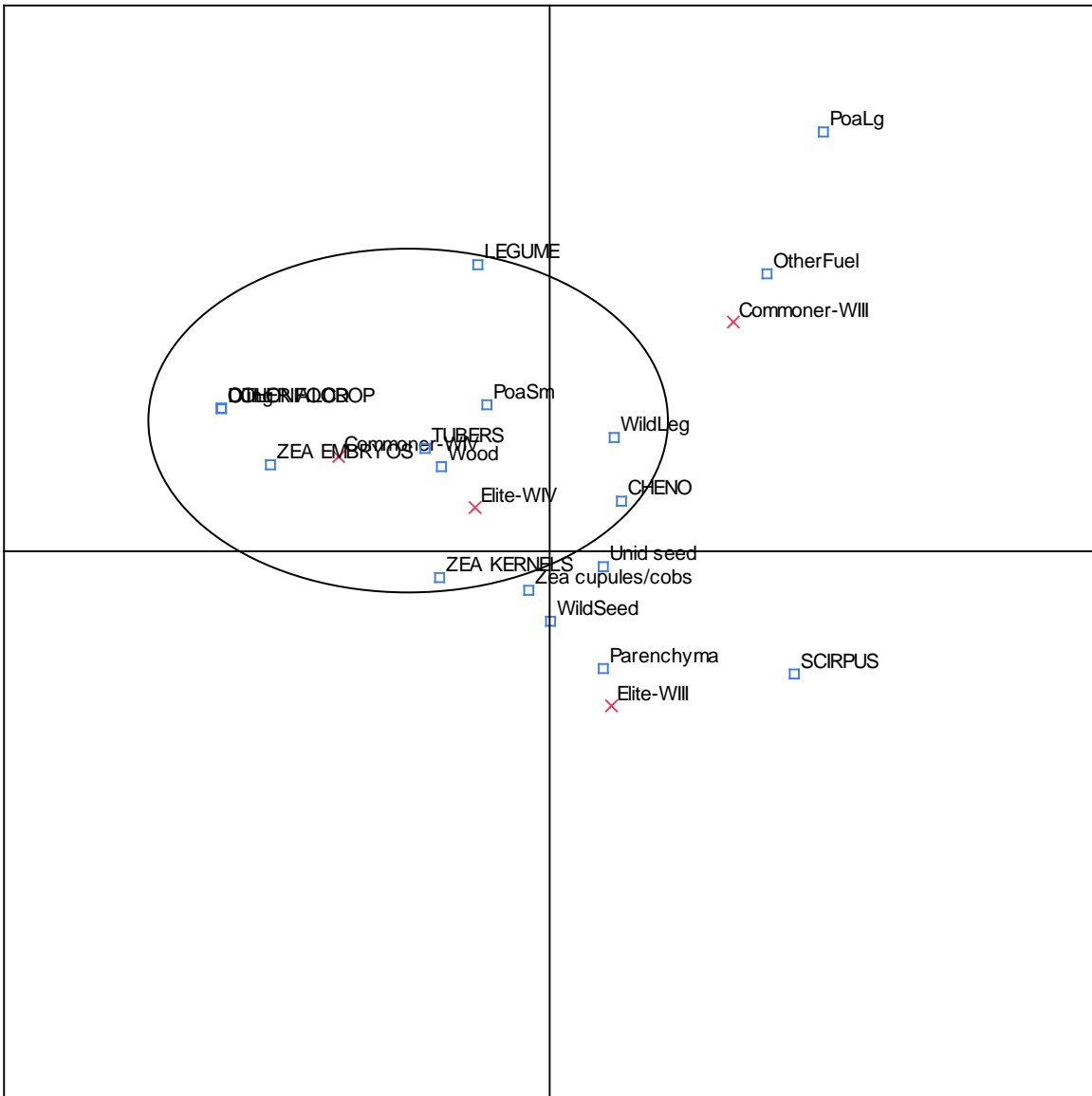
**Figure 5.28** – Analysis of botanical remains at Marca by ASD type



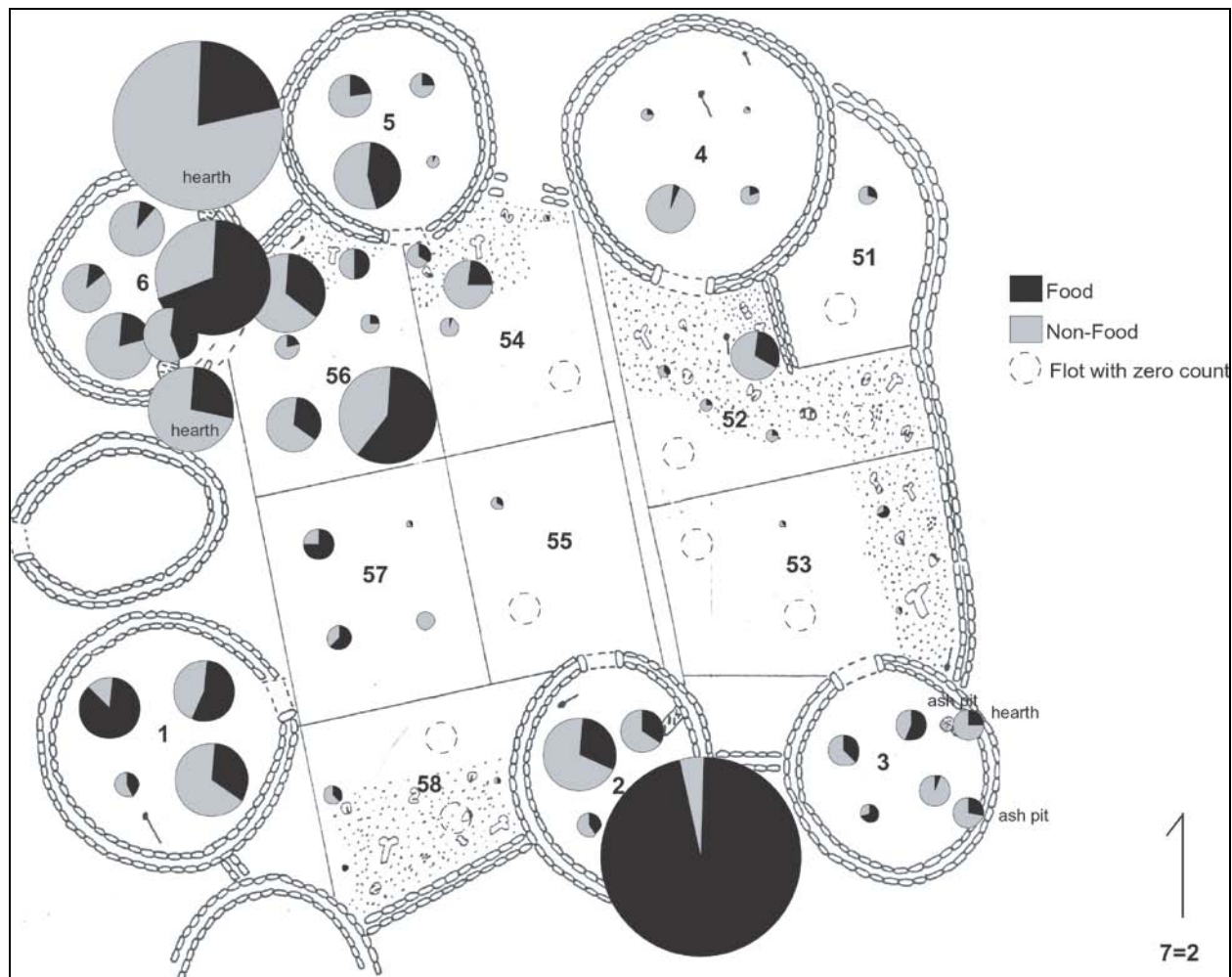
**Figure 5.29** – Analysis of botanical remains at Marca by phase



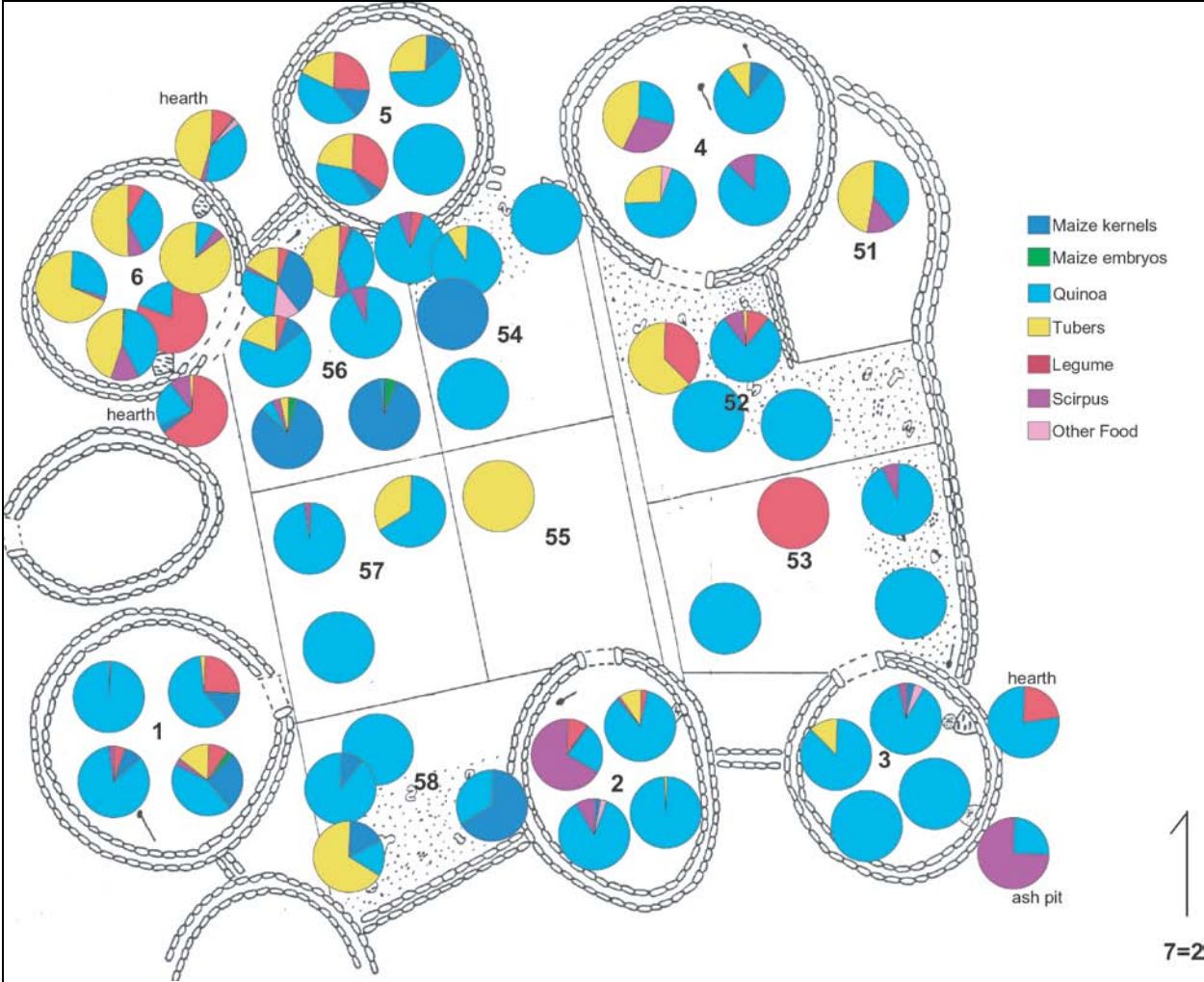
**Figure 5.30** – Analysis of botanical remains at Marca by status and phase



**Figure 5.31** – Floor Plan of 7=2 showing distribution of food-related and non-food related botanical remains



**Figure 5.32** – Floor Plan of 7=2 showing distribution of food-related botanical remains



## **CHAPTER 6**

### **CHANGING XAUXA FOODWAYS**

This study presents a multivariate analysis of plant remains in Xauxa domestic structures in an attempt to understand household food-related practices before and after the Inka conquest. It addresses three related questions: (1) What was the nature of Xauxa household plant use? (2) How did domestic food-related practices vary across households, among sites, and over time? (3) In what ways did feasting activities among the Xauxa serve as an expression of their changing political economy? Three interrelated theoretical outlooks frame the investigations: household archaeology, practice theory, and the study of foodways. The analysis uses paleoethnobotany as both a methodology and an interpretive approach, demonstrating the ways in which multivariate statistical analysis can help elucidate meaningful patterns botanical data.

This chapter discusses the findings of the paleoethnobotanical analysis. It draws on the theoretical approaches outlined in Chapter 3 to interpret the botanical data as it relates to Xauxa domestic practice and political economy. Special attention is also paid to the implications that the findings may have for methodological issues in paleoethnobotanical studies.

#### **XAUXA FEASTING AND THE POLITICAL ECONOMY**

This study addresses questions of regional political development from the standpoint of daily practice. The approach follows Pauketat (2000) and Roscoe (1993), who argue that practice theory may provide uniquely insightful explanations for political and social transformations. As Dietler (2001) notes, the study of feasting allows for a practice-oriented approach to questions of political structure and development. Feasts are social performances rooted in materiality; they are important arenas for the negotiation of power, the mobilization of economic resources, and the creation of social identity. Feasting is therefore a process, visible in the archaeological record, that may serve as a bridge to understanding the political economy from a practice-based perspective.

#### **Feasting in Wanka II Households**

One of the most striking findings of the paleoethnobotanical analysis is the evidence for feasting activities that took place in certain elite domestic compounds of the northern alliance sites during Wanka II, before the Inka conquest. These events may have most resembled Dietler's (2001) patron-role feasts, used to maintain and reinforce pre-existing power inequalities. Although they would serve to emphasize social differences, such feasts would have been inclusive and distinguished from everyday meals by their quantity of food. Previous UMAP studies (D'Altroy 1981, 2001a; Earle et al. 1987; Hastorf 1983) have painted a picture

of Wanka II as a time of fierce regional competition and political flux. The *cinchecona*, or warleaders, would have needed to mobilize labor to organize community defenses as well as to cultivate maize in fields at considerable distances from their hilltop fortified settlements. In keeping with a well documented Andean tradition (Allen 1988, 2009; Isbell 1978; Jennings and Bowser 2009; Hastorf and Johannessen 1993), these rising leaders may have held work feasts in exchange for labor, at once publicly establishing their social and political positions and discharging their reciprocal obligations. The contextual analysis of patio group 7=2 at Tunanmarca emphasizes the performative aspect of this feasting: it appears that the busiest area of food preparation was situated right at the entrance to the compound, so that whoever walked in would be immediately impressed with a bustling display of energy and piles of food. The botanical remains in elite patio groups at Tunanmarca and Umpamalca thus provide archaeological evidence of feasting that complements the political picture of the Wanka II region built by the Spanish chroniclers and previous archaeological research.

The nature of the botanical feasting signature evident at these Wanka II settlements also deserves attention. As discussed in Chapter 3, some types of feasts, such as Dietler's (2001) diacritical feasts, may be identified archaeologically through the presence of luxury foods (van der Veen 2003, 2007b; Arthur 2003), but feasting may also involve everyday foods, present in large quantities or prepared in more labor-intensive ways (VanDerwarker et al. 2007; Hastorf and Johannessen 1993; Leach 2003). A salient feature of this paleoethnobotanical analysis was the overwhelming consistency of the botanical assemblage across all domestic compounds: initially it appears that all Xauxa households used the same set of plants in similar ways. However, in keeping with VanDerwarker et al. (2007), this study demonstrates how multivariate analysis can be used to identify feasting that is not distinguished by the presence of rare plants or obvious luxury items. Patio groups 7=2 and 41=1 emerge from the analysis as distinct due to (1) the sheer quantity of their botanical remains, (2) their relatively high proportions of crop foods, and (3) their particularly large amounts of maize. Maize is strongly linked to Andean feasting traditions. As Hastorf and Johannessen (1993) explain, the role of maize shifted in Wanka II from a simple boiled food to that of a highly charged alcoholic beverage. *Chicha* would have had powerful symbolic import both for the transformations it represented and the investment of time and labor necessary to prepare it. It has therefore been widely recognized as a central component of most Andean feasts, and a key material mediator of social relationships (Bray 2003b; Hastorf 1991; Hastorf and Johannessen 1993; Jennings and Bowser 2009; Moore 1989). Maize embryos recovered from patio and floor deposits in 7=2 support the hypothesis that stages of the *chicha* brewing process were carried out in the compound. The contextual analysis of patio group 7=2 also brings out a more subtle aspect of the feasting signature identified in this study: rather than simply showing the dominance of a single food item, such as maize, the botanical assemblage actually indicates that a variety of crops, but not edible wild plants, were present in the areas of the most intense food preparation.

### **Wanka II Regional Politics through the Lens of Feasting**

Another prominent finding of the paleoethnobotanical analysis is that there was more continuity of the botanical record within sites over time than resemblance among different sites during the same time period. This is especially evident as Wanka II Hatunmarca, the posited center from the southern part of the Yanamarca Valley, emerges from the analysis as quite distinct from the northern center of Tunanmarca and its subsidiary, Umpamalca. Again, the

overall compositions of the botanical assemblage at each site are very similar, but plant remains at Hatunmarca differ in aspects of their distribution from those of the northern alliance sites. The differences are largely driven by the strong food-related groupings interpreted as feasting signatures found at both Tunanmarca and Umpamalca, for which there is no counterpart at Wanka II Hatunmarca. Archaeologists must always be cautious about interpreting absence; it is possible that *cinchecona* at Hatunmarca hosted similar feasts to those at the northern alliance sites, in compounds that simply were not excavated by UMARP.

It is also possible that these differences in botanical patterning point to important social and political differences between the northern and southern areas of the Yanamarca Valley during Wanka II. While leaders at both northern sites appear to have hosted household-based feasts as part of their efforts to consolidate their political power, affirm their social position, and reinforce their command of labor, feasts at Hatunmarca may have been held in public plazas or at agricultural worksites, they may have been much smaller-scale affairs with no visible impact on the archaeological record (Kirch 2001), or they may not have taken place at all. Each of these scenarios would have implications for differing socio-political development in the northern and southern sites, and further excavations in domestic compounds as well as public plazas at Hatunmarca could be very informative. What is known is that the fates of the northern and southern sites diverged greatly with the Inka conquest: while Tunanmarca and Umpamalca were abandoned and their populations presumably resettled in smaller, indefensible locations closer to the agricultural valley bottoms, a portion of Hatunmarca's residents remained at the site under Inka rule. It is possible that the bulk of the fierce Xauxa resistance against the Inka chronicled in ethnohistoric documents (D'Altroy 2001a) came from the *cinchecona* of the northern alliance sites, whose political feasting activities we have identified in the archaeological record, but leadership at Hatunmarca had not developed in such a way as to present significant opposition to the Inka.

### **Feasting with the Inka in Wanka III**

None of the Wanka III contexts have the feasting signature evident in the two Wanka II households discussed above, but another important finding of the paleoethnobotanical analysis is that the activities of Wanka III households may have been geared in part towards provisioning feasts that took place elsewhere. As previous researchers have demonstrated (D'Altroy and Hastorf 1984; Hastorf 1990, 1991; Hastorf and Johannessen 1993), the Inka controlled the production of their subsidiary Xauxa settlements and extracted tribute in the form of both staple agricultural goods and wealth products, which they kept in large state storehouses, or *qollqa*. The responsibility for hosting feasts, and the social and political gains that went with that, most likely shifted from local Xauxa civic leaders to the Inka rulers at the state center of Hatun Xauxa.

This study contributes to our understanding of the Xauxa domestic economy under Inka rule in three different ways. First, the paleoethnobotanical analysis supports previous findings that the household assemblages of Wanka III have a greater abundance maize (Hastorf 1990, 2001; Hastorf and Johannessen 1993), as well as other high-value crop foods. This is especially evident tracing the trajectory of Hatunmarca, which associates more closely with food-related remains over time, on into the Wanka IV colonial period. Second, the paleoethnobotanical analysis also confirms the leveling effect found for the region (Costin and Earle 1989; Hastorf and Johannessen 1993), with the notable exception of Hatunmarca. While social stratification

among Xauxa households generally becomes less striking under Inka rule, the botanical assemblages of commoner and elite contexts at Hatunmarca in fact become more different during Wanka III. This may reflect a privileged position of the local Xauxa administrators for the Inka state at Hatunmarca. Third, the paleoethnobotanical analysis builds on Hastorf's (1991) hypothesis that the activities of Xauxa women became more circumscribed as the demand for their labor intensified under Inka rule. While Hastorf's argument develops from a contextual analysis of one Wanka III patio group at Marca, this study demonstrates that the whole site is characterized by a more restricted deposition of many crop and food-related remains. Botanical deposits in structures and patios at Marca are distinct from each other, with the majority of food-related remains found in structures. There is also a clear spatial distinction between edible parts of maize and its inedible by-products, suggesting a fairly distinct division between maize storage and processing activities on patios and maize preparation and cooking within structures. These spatial divisions are not evident at Hatunmarca during Wanka III, however. It is possible that Marca, located just 5 km north of the Inka center of Hatun Xauxa and overlooking the Inka road, felt the burden of Inka labor demand more keenly than the more distant Hatunmarca, and Marca women experienced the effects of the centralized state more acutely in their everyday lives.

#### **Wanka IV: Feasting on the Leftovers**

It was not one of the original goals of the UMARP investigations to study colonial-period occupations in the Xauxa region, but the paleoethnobotanical analysis of these contexts has proven illuminating. Although there is a continued increase in food-related remains, no feasting signatures like those seen in Wanka II are evident, and the data does not suggest that households were engaged in provisioning feasts that took place elsewhere. Wanka IV households at both Hatunmarca and Marca show increased association with food-related remains, suggesting greater access for individual households to food-related crop plants with the defeat of the Inka and under Spanish colonial rule. This may emphasize the extent to which the Inka exerted control over valuable goods and labor during their administration. With the Spanish conquest and the disruption of Inka state control, the Xauxa continued to maintain the *qollqa*, continuing to stock them, and drawing from them until they were depleted (D'Altroy and Hastorf 1984). Rather than provisioning feasts for state-sponsored labor parties, the contents of the *qollqa* may have been distributed to local households. The increase in food-related remains is more pronounced at Marca than at Hatunmarca, suggesting that while the residents of this site may have felt the burden of Inka state demands more keenly during Wanka III, as suggested above, they may have benefitted from their proximity to the *qollqa* under colonial administration. Of note, the paleoethnobotanical analysis does not show evidence of local attempts to consolidate political power through feasting during this period. Rather the leveling effect discussed above continues into Wanka IV at Marca, where it appears elite and commoner households alike benefitted from the redistribution of staple goods from the *qollqa*.

### **FOOD-RELATED PRACTICE IN XAUXA HOUSEHOLDS**

#### **Intrahousehold Organization**

As discussed in Chapter 3, households are not irreducible units in a larger socio-economic network, but rather entities with diverse membership whose physical space may

change over time. The findings of this paleoethnobotanical analysis must be considered with this in mind. A household is often comprised of multiple, competing interests and dynamic alliances among its members (Robin 2003; Hendon 1996; Allison 1999; Pader 1993). Just as Wanka II appears to have been a time of political tensions and flux on a regional scale, similar negotiations of power may have played out within individual households. The contextual analysis of botanical remains at 7=2 demonstrates how we can begin to see the differential use of space throughout a compound. Deposits in different structures and patio areas vary in both abundance and diversity of botanical remains, and there appear to be at least two different possible loci of most intense activity. Previous UMARP investigations have shown that structures within patio groups were likely used for residential rather than specialized purposes (D'Altroy 2001b; Earle et al. 1984; Earle et al. 1985, 1987), and it is possible that especially in larger compounds these structures were occupied by different household subgroups. The spatial differentiation evident in the botanical remains in 7=2 may therefore reflect the different activities of various members of an elite household, each with their own agendas and vested interest in the social and political implications of the feasts they hosted.

As Appadurai (1981) notes, food can be a multivalent tool used by social actors to negotiate their roles, and meanings associated with the exchange of food at communal feasts can carry over to household meals. Although it appears from the paleoethnobotanical analysis that feasting did not take place in Xauxa households after Wanka II, it is intriguing to consider that household members may have continued to incorporate feasting motifs into their everyday meals as maize and other food-related items became more abundant in households throughout Wanka III and IV. Just as Smith (2006) argues that the cultivation and consumption of rice allowed rural farmers in South Asia to achieve a sense of status elevation, household-based *chicha* brewing after the Inka conquest may have provided different members of Xauxa households with opportunities to negotiate their social identities.

The paleoethnobotanical analysis may also contribute to an “engendered” understanding of Xauxa household dynamics. The deposition of botanical remains in Xauxa domestic spaces reflects in large part the activities of women. As Bray (2003a) has noted, feasting may serve to elevate the social and political position of men, but it is the female members of the household who often do the majority of work to prepare and host the feast. *Chicha* brewing may have therefore been a locus of power for the women of elite Wanka II households in Tunanmarca and Umpamalca, because it was their efforts that allowed their households to attain greater social and political status. Alternatively, *chicha* brewing may have served to subjugate women’s labor and constrain their social roles. To this end, we have seen how the restricted pattern of plant deposition at Wanka III Marca may reflect the impact of the Inka state on the lives of Xauxa women.

Finally, the paleoethnobotanical analysis calls attention to the ways in which the physical space occupied by households may change over time. Houses may have life cycles that reflect changes in the household: structures may be added as membership grows (Haviland 1988), and new houses may be built from old ones (Tourtellot 1988; Tringham 2000). While the feasting signature evident in 7=2 at Tunanmarca comes from contexts contemporaneous with the occupation of the compound, the majority of maize and other food-related remains found in 41=1 at Umpamalca come from subfloor fill deposits. These deposits likely represent refuse from feasting activities that took place before this compound was built, either in a previous compound at the same location, or nearby within the same elite residential sector. The presence of these

feasting remains may link the members of the household who occupied patio group 41=1 to a previous physical space and provide a window into their development as a household over time.

### **Suprahousehold Organization**

Chapter 3 reviews the ways in which individual households may articulate with larger social, political, economic, and religious networks. The findings of this study contribute to our understanding of status distinctions among Xauxa households, and may be informed by a consideration of the *ayllu* corporate structure. As discussed above, the botanical assemblage is most remarkable for its consistency rather than variability across Xauxa households. This contrasts with Lentz's (1991) investigations of botanical remains in Maya residential structures, where a higher diversity of edible plants were found in high status compounds, implying that lower classes had inadequate access to nutrition. Although the same types of plants are present in both elite and commoner Xauxa households, the paleoethnobotanical analysis does point to some differences. Elite households are consistently more closely associated with food-related remains, even as status distinctions become attenuated in Wanka III under Inka rule. Elite households are also more strongly associated with wood, suggesting that they had preferential access to this more valuable fuel source, while commoner households burned more animal dung, twigs, and grasses.

Interestingly, it is commoner compounds that are most often outliers in the botanical analysis: patio group 7=5 at Tunanmarca stands out even in the regional analysis for its large deposit of camelid dung, as well as a strong association with weedy plants, while the only two exclusively commoner patio groups at Hatunmarca appear to be distinct from each other as well as other compounds at the site. These findings hint at a wide variability among commoner households, calling attention to the fact that this analytical category likely encompasses a diversity of lived experiences (Brumfiel 1992; Marcus 2004; Robin 2003).

The paleoethnobotanical analysis also highlights variability among Xauxa elite households. Not only do patio groups 7=2 and 41=1 stand out from other elite residences for their proposed feasting signatures, but these are the only compounds in which remains of coca and *achiote* were recovered. These highly valued exotic plants were too rare to contribute to the statistical analysis, but their presence serves to emphasize the special status of these households. Local leaders from these elite Wanka II households may have benefitted from preferential access to production at *ceja de montaña* outposts in the eastern Andean cloud forests (Hastorf 1987).

Although it is challenging to recognize the *ayllu* archaeologically (Janusek 2003; Nash 2009; Stannish 1989), it is important to view the paleoethnobotanical findings in light of this Andean form of corporate organization. Members of Xauxa households were most likely linked to other households through this flexible, nested set of affiliations. As Brown (2001) finds at Cerén, preparations for Maya household feasts involved women from other households who came with their own *manos* to contribute labor. The feasting households at Tunanmarca and Umpamalca most likely also recruited labor from other households, which were possibly tied to them through *ayllu* group affiliations. As discussed below, these compounds had disproportionately large amounts of edible maize parts versus their processing by-products, indicating that these households benefitted from maize processing labor done elsewhere, perhaps by members of other households tied to them through their *ayllu*.

## **XAUXA DAILY PLANT USE**

The paleoethnobotanical analysis calls attention to some specific aspects of Xauxa daily plant use that merit discussion, including the use of space within houses and the significance of specific taxa.

### **Spatial Organization of Labor**

Rather than characterizing activity areas in Xauxa households, the paleoethnobotanical analysis found wide variability in the use of domestic space as evidenced by the deposition of botanical remains. While some sites such as Marca, discussed above, showed clear associations of food-related remains with enclosed structures and non-food remains with open patios, households at other sites did not have such a clear distinction between deposits in structures and patios. One trend that had some consistency across sites involved fuel related items. Although the majority of hearths are located inside structures, most possible fuel sources tended to be found on patios. This may indicate that while wood, dung, and other fuel were burned in the cooking hearths, they were stored or disposed of on the patios outside.

When maize is analyzed in terms of its component parts, an interesting pattern emerges for the region. The regression analysis of maize kernels and embryos versus cupules and cobs shows that for the most part, both the edible parts of maize and its by-products are found together. This indicates that maize processing was usually done at the same location as cooking and consumption. However, when very large amounts of maize were involved, preparation and consumption happened separately from maize processing. This trend is driven by the two compounds where the feasting signature is evident, implying that household-based feasts in Wanka II required a different spatial organization of labor from daily domestic economic activities. At Tunanmarca, the edible parts of maize are clearly associated with elite contexts, but maize cupules and cobs are evenly distributed between elite and commoner households. This indicates that maize processing may have been done in all households, but the products of the processing were likely to have been brought to the elite compounds for cooking and consumption.

### **The Use of *Scirpus***

One of the more perplexing findings of the paleoethnobotanical analysis was the ubiquitous presence of *Scirpus* remains and their strong correlation with food-related plants. There are several possibilities that may explain this association. This grass-like plant from the sedge family may have entered domestic compounds unintentionally as a weedy taxon associated with certain crops, but this seems unlikely because the plant is usually found in marshy wetlands around lakes rather than in the zones where the crop plants were grown. Alternatively, *Scirpus* leaves or stems could have been woven into baskets or mats to store or present food. This may be supported by the contextual analysis of 7=2, which finds *Scirpus* present in a possible storage area of the patio that has few other botanical remains. Similarly, *Scirpus* does not appear to trend spatially with other food-related plants at Marca, appearing more frequently out on patios rather than inside structures. Most intriguingly, *Scirpus* could have been prepared and consumed as food itself. Fritz (2007) cautions that a cultural bias towards domesticated plants may prevent

archaeologists from recognizing the importance of wild and weedy sources of food. Chapter 5 reviews ethnobotanical and archaeological evidence for the consumption of *Scirpus* in Chile and Bolivia. *Scirpus* remains in Xauxa household compounds may therefore represent a previously unrecognized source of food, which unlike other major food plants was not a fully domesticated crop.

### **Interpreting *Quinoa***

Another salient feature of the paleoethnobotanical analysis was the ubiquity of *quinoa* across all contexts. Moreover, the presence of *quinoa* in Xauxa households seems to stay consistent over time. This constant ubiquity underscores the importance of *quinoa* in the prehispanic Andes. The distribution of *quinoa* within patio groups raises two possible methodological issues. On the regional level, *quinoa* appears to be equally distributed between structures and patios, and the contextual analysis of 7=2 shows that it is present in almost every sample in fairly high proportions. This may point to the fact that botanical remains rarely represent primary deposits (Miksicek; Schiffer 1983), and the small, round seeds of *quinoa* were likely to have been scattered everywhere. The lack of differentiation may also indicate that the items identified as *Chenopodium* in fact represent a mixture of both weedy and domesticated taxa, entering the site in different ways and used for different purposes. Despite its constant ubiquity, it is unlikely that *quinoa* simply represents background noise in the analysis: the densest sample from 7=2 is due to a large deposit of *quinoa* found inside one of the structures.

### **Dung and Weedy Seeds**

The paleoethnobotanical analysis tends to support Miller's (1984, 1996) "dung hypothesis," which holds that carbonized weedy seeds may have been animal fodder rather than human food, and entered sites as dung cakes that were burned as fuel. Many of the seed types that Hastorf and Wright (1998) identified as occurring commonly in camelid and goat dung, such as *Relbunium*, small and large grasses, and wild legumes, were found to be associated with dung in this analysis. This is most vividly illustrated by commoner patio group 7=5 at Tunanmarca, which is clearly distinguished from other compounds by a particularly large amount of dung as well as wild seeds, wild legumes, and unidentified seeds.

## **PALEOETHNOBOTANICAL METHODOLOGY**

This study contributes to our understanding of several methodological issues in paleoethnobotany, including botanical collection and systematic sampling, interpreting taphonomic processes, and the use of exploratory data analysis.

### **Comparing Flotation and Screen Collections**

The majority of botanical remains were collected according to the sampling strategy described in Chapter 5 and recovered by flotation. A smaller number of botanical remains were also collected from the screens and treated as a separate data set. While the screen data set reflects the excavators' bias towards plants with large, recognizable seeds, it also strengthens the

findings of the flotation analysis. Of particular note, the results of the screen data set help to confirm the feasting signature evident in both 7=2 and 41=1 and add to the contextual analysis of 7=2. While there is clearly no substitute for systematic collection and flotation (Wagner 1988; Chapman and Watson 1993), this study demonstrates that botanical remains collected from screens can provide an important complementary data set.

### **Taphonomic Considerations**

Sikkink's (1988, 2001) ethnoarchaeological investigations of contemporary households in the Mantaro Valley highlight some taphonomic issues are particularly relevant to the paleoethnobotanical findings of this study. She found that charred remains represented only a small part of the modern plant assemblages, reminding us that even extensive paleoethnobotanical collection can only recover a fraction of the plants that were used prehistorically. However, she found a systemic bias in the charred remains: crop taxa did have a higher chance of becoming charred, and cultural activity increased the likelihood of carbonization. Moreover, she found that kitchen areas where food was prepared showed a high diversity of food-related remains, with crop samples present in higher densities. These results support the link this study makes between the presence of food-related remains and the activities of food preparation, cooking and consumption.

The contextual analysis of patio group 7=2 raises an interesting taphonomic question. Middens in the compound did not yield very dense botanical deposits, and most of the patio area with the highest density of botanical remains has no midden at all. It is possible that botanical deposition within the middens is not homogenous, and if samples had been taken from corners and directly against walls they would have revealed much more dense botanical deposits. It is also possible that this reflects how the occupants of the compound may have discarded plant materials differently from the ceramic, lithic, and bone artifacts that make up the middens.

### **Correspondence Analysis and Paleoethnobotanical Data**

Finally, this study demonstrates how correspondence analysis, and other exploratory statistical techniques, can be used to interpret paleoethnobotanical data. As discussed in Chapter 4, exploratory data analysis constitutes an approach to data that is hypothesis-forming rather than hypothesis testing. This study did not propose to test a particular model, but rather sought to identify meaningful patterns in the paleoethnobotanical data that might reflect human activity. Correspondence analysis has been increasingly recognized as a particularly useful technique for detecting patterns in paleoethnobotanical data (e.g., Powers et al 1989; Ishida et al. 2003; Kerig and Lechterbeck 2004; Colledge 1998; van der Veen 2007). It is well suited to archaeological context variables, makes no assumptions about their distributions, and does not require any prior model or expectations (Madsen 1988). The paleoethnobotanical data set analyzed in this study consists of a wide variety of botanical remains, present in greatly varying amounts across many different archaeological contexts. Similar to VanDerwarker et al.'s (2007) experience, initial exploration of the data with univariate techniques failed to show any particular patterns in their deposition. Correspondence analysis provided a way to detect subtle but significant associations among the botanical categories and archaeological contexts in which they were found.

## **Changing Xauxa Foodways**

In summary, this study has explored the ways in which Xauxa food-related practices were manifest at the household level through multivariate statistical analyses of a large and complex paleoethnobotanical data set. It has contributed to our understanding of Xauxa household plant use, and traced various ways in which domestic food-related practices reflected status distinctions among households, differences between sites, and changes in the political economy over time. Most significantly, this study has provided botanical evidence for household-based feasting activities during Wanka II, a finding that enhances our understanding of Xauxa political development before and after the Inka conquest.

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